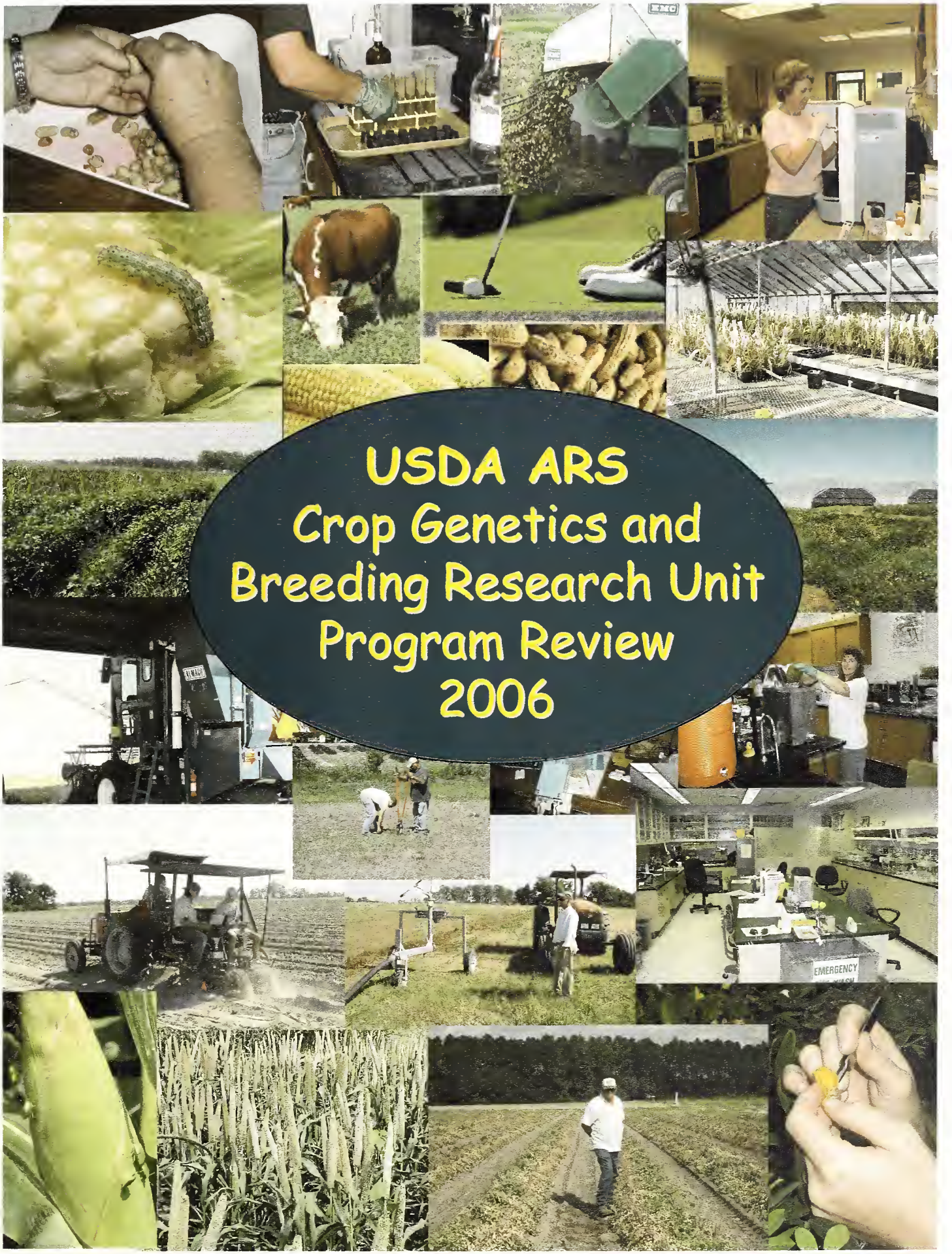
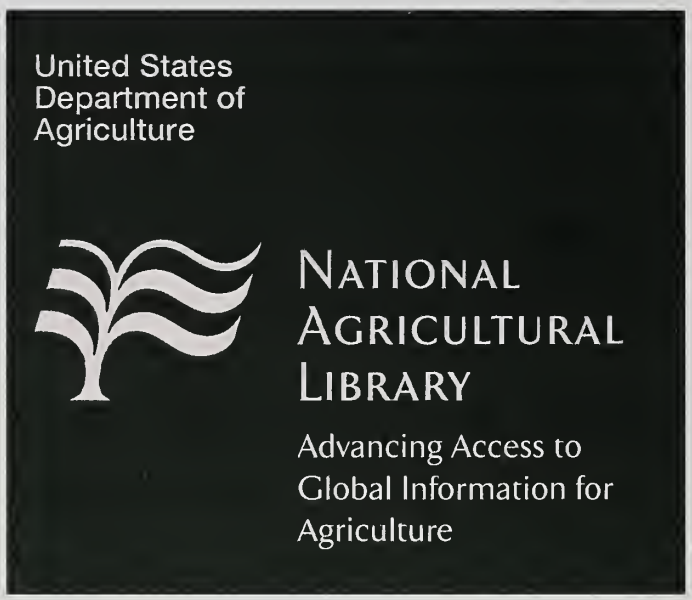

USDA ARS
Crop Genetics and
Breeding Research Unit
Program Review
2006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Program Review Briefing Book
USDA, ARS, Crop Genetics and Breeding Research Unit
Tifton, GA
July 26, 2006

Table of Contents

INTRODUCTION AND RATIONALE

PURPOSE OF REVIEWS: The fresh perspective of outside reviewers yields objective and useful insights. In-depth reviews of individual Research Units and location provide valuable information about the strengths and weaknesses of our programs and assist the Area in planning improvements and management actions.

COMPOSITION OF REVIEW PANEL: Members of Review Panels are chosen to cover the scope of expertise and research programs in the Crop Genetics and Research Unit. The Review Panel and Chair of the review panel were selected by the Area Director and Research Leader with consultation of the ARS National Program Staff. The Chairperson, Research Leader, and Area Director then work together to choose other members of the Review Panel.

CHARGE: Review Panels are charged with conducting an objective evaluation of a Research Unit. We ask the review panel to examine the effectiveness of the Unit's overall program in implementing the ARS mission as well as the progress in meeting objectives of each research (CRIS) project. Also, the panel is to evaluate management effectiveness by considering the relationships between staff, funds, facilities, equipment, resource deployment, and leadership. The Panel's judgment on the effectiveness of any collaboration of the Unit with other laboratories, with other ARS locations, government agencies, and universities or technology transfer interactions with industry is of high interest to us. Other specific charges may be given to the panel at an initial executive session on the first morning of the review.

In this type of review, research direction is not a primary focus. The agency has provided direction by funding the past and ongoing projects. The objectives of an Area review of the Unit are different from those of an NPS review.

The research direction may come up during the review but that is not the principle focus of the review (NPS workshops focus on direction issues). Area reviews focus on progress in accomplishing the research objectives of ARS approved projects, as well as associated issues such as funding, research capacity, and facilities.

Review panels prepare written reports that are submitted confidentially to the Area Director for use by ARS management. Effective reports are candid, concise, and identify both the positive aspects of the Unit's operation and problems that need to be addressed. The first draft of the report is prepared on-site as part of the review exercise. We also ask that you prepare and deliver an oral summary of your impressions in a meeting with the Research Leader and Unit Scientists as the final step before adjourning the on-site review.

BRIEFING BOOK: About 1 month before the review, the panel will receive a briefing book from the Research Leader, that contains information about the personnel, research projects, and finances of the Research Unit to be reviewed. Please become familiar with this material in advance of the review.

OVERVIEW OF THE REVIEW PROCESS: The review will begin with an executive session with Area managers and one or more members of the ARS National Program Staff (NPS). In this session, we will present specific issues or concerns that we wish to have examined by the panel. In an opening session, there will be an overview of research program history, accomplishments, and goals for the future, given by the Research Leader. Also, each scientist will present a 10-15 minute synopsis of his/her research. Following these initial meetings, the panel will be given a brief tour of the Location's facilities. The panel will then interview each individual scientist to obtain detailed information about research programs and progress. Twenty minutes will be scheduled for each interview. After the interviews, the panel will have time to prepare a draft report, which will be discussed with Area managers and the NPS representative. In the final step of the review process, Review Panels are encouraged to present a brief oral summary of their impressions in a meeting with the Research Leader and the scientists of the Unit.

FINAL REPORT: The draft report will be prepared by the review panel following the review. To be of maximum value, we need to have the final report in hand within 30 days following the review. The report will be submitted confidentially to the Area Director, who will distribute it to key members of the National Program Staff, and possibly others in ARS, depending upon the content of the report. The length of the report will depend on the size of the Research Unit and the issues that need to be addressed. The use of headings will contribute to the readability of reports. Action items for improving the program and management of the Unit will be derived from the Reviewer's recommendations.

DEFINITION OF SOME TERMS, ABBREVIATIONS, AND ACRONYMS USED IN ARS

ARS: The Agricultural Research Service (ARS) is the principal in-house research agency of the U.S. Department of Agriculture (USDA). ARS, one of the Research, Education and Economics (REE) agencies, is charged with extending the Nation's scientific knowledge with 22 National Programs, comprised of research projects in agriculture, nutrition, technology, the environment and other topics that affect the American people on a daily basis.

ARS has about 8,000 employees, including 2,000 senior scientists. The Agency conducts research at 104 locations in the United States. ARS is led by an Administrator and is divided geographically into eight Areas, which are led by Area Directors as well as a National Agricultural Library in Beltsville, MD. More information can be found at http://www.ars.usda.gov

SAA: The South Atlantic Area (SAA) consists of 37 Research Units located at 17 sites in Florida, Georgia, North Carolina, South Carolina, Virginia, Puerto Rico, and Virgin Islands. For FY 2003, 796 FTE (full-time equivalent) employees were included in the budget. In addition, 69 nonfederal employees work in various SAA facilities. Nonfederal employees include technicians and students whose services are obtained through Research Support Agreements (RSA) or other cooperative agreements with Universities, and other temporary employees hired through various local, state, and federal programs. More information about the SAA can be found at http://www.ars.usda.gov/pandp/locations/locations.htm?modecode=66-00-00-00

NPS: National Program Staff. Members are called National Program Leaders and each is a subject matter specialist. NPS serves the Administrator of ARS in developing and coordinating research plans and strategies on a national basis. NPS sets National Program directions, establishes priorities, allocates resources, and acts as a clearing house for program related decision making. Considerable interaction between Area managers and NPS is required to fulfill their respective roles.

ARS National Programs: ARS Research is organized into 22 National Programs. These programs serve to bring coordination, communication and empowerment to the more than 1200 research projects carried out by ARS. The National Programs focus on the relevance, impact, and quality of ARS research. More information can be found at http://www.ars.usda.gov/research/programs.htm

OSQR: The peer review process conducted by the Office of Scientific Quality Review (OSQR) involves independent and expert scientific peer review of ARS project plans. This is a critical component of research planning. In this way, OSQR contributes to the National Programs' focus on quality of ARS research.

Research Units: Research Units are the basic management unit within ARS. Research Units are groups of research scientists and support staff that are pursuing research related by discipline,

subject of investigation process, technology, goal or commodity. There is at least one (sometimes several) CRIS projects in each Unit. Research Units are led, both scientifically and administratively, by Research Leaders. Typically, a Research Unit is comprised of 5-15 research scientists, a scientific and clerical support staff, and temporary student and postdoctoral employees. In reviewing a Research Unit, bear in mind that what appear to be discipline or program gaps are often filled by collaboration with other Units and Laboratories in the SAA or elsewhere.

Laboratories or Centers: Locations with more than one Research Unit (normally comprised of three or more research units) may be called a Laboratory or Center. These are administered by a Laboratory or Center Director. Additionally, some research units are named 'Laboratories' due to Congressional mandates but function as research Units.

AFM: Administrative & Financial Management. This branch of ARS located at the Headquarters in Beltsville, Maryland, manages support activities, such as procurement, facilities, fiscal allocations, and personnel operations at all levels in ARS. Each Area and Location have staff to support these activities within their delegation of authorities.

SY: Scientist Year. This is the effort of a research scientist for 1 year. Fractional efforts (e.g., 0.5 SY) in a given project are possible when a scientist works on more than one project during the course of a fiscal year. The term is also used in ARS as a synonym for a research scientist [e.g., "I have six SY's (research scientists) in my Unit"].

OTHER KINDS OF SCIENTIFIC PERSONNEL: Research scientists are responsible for all phases of research. ARS also employs research associates ("postdocs"), support scientists (who have responsibility for some, but not all, phases of a project), technicians, students and, in some operations, non-research scientific personnel who perform work involving service to the public or to other government agencies.

CRIS PROJECT: CRIS stands for "Current Research Information System." This is an electronic system for the filing and retrieval of information about individual agricultural research projects. In ARS, the terms "CRIS Work Unit" or the acronym "CRIS" are used synonymously with "research project" or "project." New projects are planned in coordination with NPS and are subjected to peer-review through OSQR. The normal life of a project in ARS is 5 years.

USDA/ARS Crop Genetics and Breeding Research Unit
Program Review
July 26, 2006

Agenda

Introduction, Panel Responsibilities, and Overview

8:15 a.m. to 8:45 a.m.	Executive Session SEWRU Large Conference Room (Panel Members and ARS Management)
8:45 a.m. to 9:00 a.m.	ALL HANDS IN ATTENDANCE INTRODUCTION OF REVIEW TEAM AND OBJECTIVES Overview of CGBRU: Unit History, Accomplishments, Current Program Structure (Corley Holbrook, Research Leader)

Individual CGBRU Research Scientist's Presentations

9:00 a.m. to 9:10 a.m.	Jeffrey P. Wilson
9:10 a.m. to 9:20a.m.	William F. (Bill) Anderson
9:20 a.m. to 9:30 a.m.	Andrea L. Maas
9:30 a.m. to 9:40 a.m.	Matthew D. Krakowsky
9:40 a.m. to 9:50 a.m.	Xinzhi Ni
9:50 a.m. to 10:00 a.m.	C. Corley Holbrook, Research Leader
10:00 a.m. to 10:15 a.m.	Break
10:15 a.m. to 10:45 a.m.	Meet with Support Staff (w/o SY or RL)
10:45 a.m. to 11:15 a.m.	Walk-through CGBRU facilities
11:15 a.m. to 12:30 p.m.	Lunch (in house)

Individual Scientist/Review Team Meetings

12:30 p.m. to 12:50 p.m.	Jeffrey P. Wilson
12:50 p.m. to 1:10 p.m.	William F. (Bill) Anderson
1:10 p.m. to 1:30 p.m.	Andrea L. Maas
1:30 p.m. to 1:50 p.m.	Matthew D. Krakowsky
1:50 p.m. to 2:10 p.m.	Xinzhi Ni
2:10 p.m. to 2:45 p.m.	C. Corley Holbrook, Research Leader
2:45 p.m. to 3:30 p.m.	Panel break and discussion time
3:30 p.m. to 4:00 p.m.	Oral comments to SY's as appropriate

ADJOURN

THE PANEL WILL NOT PREPARE A REPORT ON SITE BUT WILL INCLUDE AREA MANAGEMENT DURING DISCUSSION FROM 2:45 TO 3:30.

Members of Review Team

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Crop Genetics and Breeding Research Unit Mission Statement

The mission of the Crop Genetics and Breeding Research Unit is to conduct research to solve agricultural and environmental problems of regional and national interest. To fulfill this mission, the Unit will: 1) collect, evaluate, develop, preserve and distribute germplasm with improved biological and agricultural characteristics; (2) develop new and improved breeding methods, genetic populations, breeding lines and cultivars to enhance agricultural production and efficiency; (3) develop new and improved management practices that increase yields, minimize production and utilization losses, and enhance environmental quality; and (4) develop pest management strategies that are economical, sustainable and environmentally sound. Research is conducted on warm-season forage and turf grasses, maize, peanut, pearl millet and sorghum. The Unit will conduct basic, developmental and applied research to establish principles and practices that are transferred to industry.

Summary of Research Accomplishments (2003-2005)

CRIS Project 6602-21410-004-00D
Genetic Enhancement and Management of Warm-Season Grass Species for Forage and Alternative Uses

Perennial Grasses

- TifQuick bahiagrass to be released. The imminent release of 'TifQuik', a new faster germinating bahiagrass cultivar will allow faster establishment of bahiagrass in pastures and in rotations to control nematodes in crops such as peanut and cotton. TifQuik has completed three years of testing and is in multi-location and grazing trials, and has been approved for joint release by USDA/ARS and the University of Georgia.
- A bermudagrass core collection has been developed. The core collection has been assessed for in vitro dry matter digestibility (IVDMD) and fiber traits. Near infrared spectroscopy (NIRS) was calibrated with wet chemistry results of fiber and digestibility for a much more efficient method of determining quality of forage bermudagrass breeding lines. The core will be used to evaluate forage and biofuel feedstock characteristics such as fall armyworm resistance, abiotic stresses, seed setting ability and genetic variation via molecular genotyping (AFLP).

Bio-Fuel Feedstocks

- Pearl millet is a promising feedstock for ethanol production. Compared to corn, pearl millet ferments 30% faster and the DDGS coproduct has a greater nutritional and economic value as measured by protein and fat content. The DDGS should also have lower concentrations of aflatoxins or fumonisins, since pearl millet is less susceptible than corn to contamination by these carcinogenic mycotoxins.
- New species were assessed as biofuel feedstocks for the south. Multiple clones of giant reed were collected and characterized for genetic and phenotypic differences. Very little genetic difference has been found among the clones using AFLP analyses. However, napiergrass has been found to have considerable phenotypic and genetic variability from field and molecular genetic studies.
- Conversion of feedstocks to ethanol was compared. Among released bermudagrass cultivars, Tifton 85 had the highest reduction of dry matter to fermentable sugars and highest amount of released ferulic acid co-product using environmentally-friendly enzymatic pretreatments. Napiergrass showed high potential for reduction of dry leaf matter to fermentable sugars for ethanol production.

Pearl Millet

- Pearl millet Tifgrain 102 released for commercial production. This hybrid represents new economic opportunities for diverse agribusiness sectors in the south. Research and technology transfer activities have provided support to farmers, recreational wildlife managers, poultry producers, seed companies, and the ethanol industry at field days, grower training meetings, and agricultural conferences and workshops.
- Advances in developing pearl millet with resistance or tolerance to biotic and abiotic stresses. The "staygreen" trait is associated with drought tolerance. A pearl millet selection with staygreen was identified and an assay was developed to compare genotypes. This research will provide greater drought tolerance, improved nitrogen use efficiency, and greater protein

content of forage. Chinch bug tolerance was identified in two pearl millet inbreds. Chinch bug is the primary insect pest of this forage grass and resistance will contribute to the stability of production in pastures. New sources of resistance to root knot nematode have been identified in African pearl millets. The resistance will add value to pearl millet in crop rotations. SSR and EST primers were used to assess genetic diversity in a collection of wild, exotic, and domestic pearl millets. The U.S. germplasms were differentiated from the wild and exotic germplasms. Clusters may identify potentially diverse sources of genes for crop improvement. A maize resistance gene analog PIC 13 (derived from *Rp3* rust resistance gene) co-segregates with rust resistance in one pearl millet inbred, and is linked 2.4 cm with two other resistance genes. PIC 13 may be useful to conduct marker assisted selection for these rust resistance genes.

CRIS Project: 6602-21220-012-00D
Genetic Improvement of Maize and Pearl Millet for Resistance to Insects and Aflatoxin

- Evaluation of *Aspergillus flavus* inoculation methods. Different methods for inoculating corn with *A. flavus* are used by different researchers, but comparisons between methods had been made. We found that in Georgia, methods that deposit the fungus inside the husk in the middle of the ear were most effective.
- Mapping of QTL for Southern Leaf Blight. This research was conducted in collaboration with a USDA-ARS researcher at Raleigh, NC, and involved mapping of QTL for southern leaf blight in corn. The disease can result in significant yield losses when infection occurs before flowering. Genes mapped in this study will be transferred into susceptible germplasm for validation and potential incorporation into susceptible elite breeding lines.
- Field screening for multiple ear-feeding insect resistance in experimental corn hybrids and inbred lines. Ten experimental hybrids and 10 of the parental inbred lines that confer corn earworm resistance have been continuously screened for maize weevil, and stink bug (i.e., brown stink bug and southern green stink bug) resistance. We identified two hybrids and two inbred lines that confer resistance to all four species of ear-feeding corn insects.
- Field evaluation of pearl millet for chinch bug resistance. Sixteen pearl millet entries (including both hybrids and inbred lines) were screened for chinch bug resistance using stunting, necrosis, dead tiller percentage, and stand loss of the plants. Planting of Dove proso millet could be used as an effective trap crop strip to establish natural infestation of chinch bugs for the screening. Three entries were identified as the most resistant, and three entries were also categorized as the most susceptible to chinch bug feeding.

CRIS Project: 6602-21000-018-00D
Development of Improved Peanut Germplasm with Resistance to Disease and Nematode Pests

- Development of a Core of the Core Collection. We had previously developed a core collection (831 accessions) to represent the U.S. germplasm collection of peanut (8,000 accessions). This core collection has been very effective in enhancing the utilization of peanut genetic resources and has resulted in the identification of hundreds of new potential parents for peanut breeding programs. However, an even smaller subset of germplasm is needed to mine peanut germplasms for traits which are difficult and/or expensive to measure. We recently selected a core of the core collection (mini core) consisting of 112 accessions. Examination of disease resistance data indicated that this mini core collection can be used to improve the efficiency of identifying desirable traits in the entire germplasm collection. This subset of peanut germplasm is currently being used by other researchers to evaluate peanut germplasm for amino acid compositions, mechanisms of resistance to drought, and polymorphisms of molecular markers.
- Development of Peanut Genotypes with Resistance to both the Peanut Root-knot Nematode and Tomato Spotted Wilt Virus (TSWV). TifGP-1 was released as the first peanut germplasm to have moderate resistance to both TSWV and the peanut root-knot nematode. Based on the pedigree and the phenotypic observations, we believe that it contains some unique genes for resistance. We plan to release C724-19-15 as the first peanut cultivar with a high level of resistance to TSWV and the peanut root-knot nematode. This is a high yielding, medium maturing genotype that should eliminate the need for nematicides even on land that is heavily infested with nematodes.
- Development of Peanut Genotypes with Resistance to Drought and Preharvest Aflatoxin Contamination (PAC). After devising large scale field screening techniques and identifying sources of resistance to drought and PAC, we built on these achievements by beginning a breeding program to combine this resistance with high yield and grade. Years of hybridization and selection have resulted in the identification of several breeding lines that have relatively high yield and relatively low PAC when grown under late season drought and heat stress. We plan to release C76-16 as a germplasm line due to its high level of resistance to drought and PAC.
- Cooperator in Several Research Efforts to Develop Improved Molecular Genetic Tools for Peanut. We are actively cooperating with several molecular genetics groups who are attempting to develop improved molecular genetic tools for peanut. This research has resulted in the development of a new and greatly improved molecular marker for nematode resistance. This marker can be used in a cost-effective, high throughput DNA extraction method and will hasten breeding efforts to combine nematode resistance with other important characteristics. These cooperative efforts have also resulted in the development and publication of several thousand EST's, the development of the first tilling population for peanut, and the development of several recombinant inbred line populations that will be very useful in future efforts to develop marker assisted selection in peanut.

Productivity Summary (Publications 2003-2006)

Scientist	1st Author	Co-Author	Abstracts/Proc. Popular Articles	Scientific/Educ. Presentations
Anderson	5	1	7	7
Holbrook	7	23	56	15
Krakowsky	5	2	12	4
Maas	3	0	3	4
Ni	4	6	16	12
Wilson	5	8	5	9

Current Research Information System (CRIS) Summary

CRIS Number:	**6602-21000-018-00D**
Title:	Development of Improved Peanut Germplasm with Resistance to Disease and Nematode Pests
Net to Location:	$429,792
National Program:	NP301 (100%)

CRIS Number:	**6602-21220-012-00D**
Title:	Genetic Improvement of Maize and Pearl Millet for Resistance to Insects and Aflatoxin
Net to Location:	$592,710
National Program:	NP301 (100%)

CRIS Number:	**6602-21410-004-00D**
Title:	Genetic Improvement and Management of Warm-Season Grass Species For Forage and Alternative Uses
Net to Location:	$1,068,102
National Program:	NP 205 (100%)

Summary of Financial Resources

	FY2004	FY2005	FY2006
Net to Location	**$2,058,491**	**$2,082,415**	**$2,090,075**
Indirect Research Costs	279,628	307,086	316,745
*Adjustments	70,000	70,000	80,000
Net to Management Unit	$1,778,863	$1,755,329	$1,773,330
Salary	1,345,400	1,349,800	1,361,600
All Other	433,463	425,529	411,730
Bench Dollars per SY	261,684	304,468	304,471
Discretionary Dollars per SY	54,303	64,505	55,288
Percent Discretionary	18.47%	18.59%	15.87%
Percent fixed funds			

*Intsormil grant

Position Staffing Plan

Employee Name	Position Number	Position Title	Pay Plan	Status	FTE	
Holbrook, C. Corley	1A2071	Supvy Res Genet Plant	GS-14	PFT	1.0	RL, Lead SY
Wilson, Jeffrey P.	1A2072	Res Plant Path	GS-14	PFT	1.0	Lead SY
Perla, Trevor J.	7A2995	Agrl Sci Res Technen (Plants)	GS-7	PFT	1.0	
Purvis, Michael	7A4783	Biol Sci Lab Technen (Plants)	GS-4	TFT	1.0	Temporary
Krakowsky, Matthew	1A2097	Res Genet (Plants)	GS-12	PFT	1.0	Lead SY
Tapp, Penny J.	7A2118	Biol Sci Technen (Plants)	GS-7	PFT	1.0	
Ni, Xinzhi	1A2098	Res Ent	GS-13	PFT	1.0	
Mullis, James C.	7A2126	Agrl Sci Res Technen (Plants)	GS-8	PFT	1.0	
Maas, Andrea L.	1A2640	Res Genet (Plants)	GS-12	PFT	1.0	
Vacant	7A5050	Biol Sci Aid	GS-1	TPT	0.5	Temporary
Howell, Wilbur T.	7A7781	Agrl Sci Res Technen (Plants)	GS-8	PFT	1.0	
Anderson, William F.	1A4115	Res Genet	GS-13	PFT	1.0	
Reeves, Sharon C.	0A4871	Biol Sci Aid	GS-3	TPT	0.62	Student
Cheek, Doyle F.	7A2888	Agrl Sci Res Technen (Plants)	GS-8	PFT	1.0	
Merriman, Jacolyn F.	7A2929	Biol Sci Lab Technen	GS-8	PFT	1.0	
Mauldin, James D.	7A4051	Agrl Sci Res Technen (Plants)	GS-9	PFT	1.0	
Golden, Jason	7A8154	Agrl Sci Res Technen (Plants)	GS-5	PFT	1.0	
Tyler, Betty R.	7A9721	Biol Sci Lab Technen	GS-6	PFT	1.0	
Barnhill, J Waldene	9A2646	Prog Suprt Asst OA	GS-7	PFT	1.0	
Marchant, Kathy W.	9A7877	Off Automation Clk	GS-5	PPT	0.8	

High Priority Needs

In the past few years all three research projects have been attempting to initiate and/or expand effort to use molecular genetic tools to accelerate breeding progress. We have critical needs for additional laboratory space and equipment so that we can fully utilize these genetic tools.

A new planter is needed for peanut. The planter currently being used is over 20 years old, and requires a tractor driver and two individuals to ride the planter. New planters are available that can be operated with a tractor driver and one individual to ride the planter. The purchase of a new planter would greatly improve planting efficiency.

We are in need of a refrigerated high-speed centrifuge with multiple rotors (fixed-angle rotor to reach 64,000 xg, and swinging bucket rotor to reach 10,000 xg). This equipment would be useful to process both plant and insect samples to better understand the biochemical mechanisms of host plant resistance to insects, and to examine proteomic interactions between the insect herbivores and their host plants.

Budget Increase Proposals

Applied Molecular Genetic Technology

Additional base funding would allow us to couple our traditional breeding methods with marker-assisted selection technologies to expedite the transfer of desirable traits. These applications will be based on DNA analysis whereby molecular markers shown to be linked with a trait of interest (e.g., nematode, insect, and disease resistances, tolerance to drought and/or heat stress, reduced aflatoxin contamination are used to accelerate the transfer of the trait to improved cultivars. Markers linked to several of these traits already have been identified and readily can be implemented, while others will require additional research to develop. Another DNA-based technique that will be used is TILLING (Targeting Induced Local Lesions IN Genomes). This technique allows the recovery of mutants in genes whose DNA sequence is known. Crop species such as peanut, cotton, and some forages are polyploid (have more than two sets of chromosomes) and mutations often are not directly detectable as a change in appearance, but could be detected at the DNA sequence level. TILLING programs are valuable for recovering mutations in allergen genes as well as other genes of known and unknown function, many of which are being discovered through expressed sequence tagged (EST) analysis.

Linking traditional breeding methods to the new marker-assisted selection techniques will expedite cultivar development. We believe this project can produce improved, market ready cultivars of forages, pearl millet, and peanut within three years. This project will also strengthen already strong links between USDA and UGA scientists at Tifton.

Expanded Efforts to Breed Southern Crops for Use as Bio-Fuels

Conversion of oil crops (such as peanut) to bio-diesel as well as biomass for ethanol and other bio-fuels are undergoing renewed interest in the United States. Bio-diesel can be easily produced with sufficient plant or animal oil feedstock. Peanut produces the most oil per acre of any crop. If new varieties and production systems can be developed to reduce input costs, peanut may be a viable feedstock for bio-diesel. Currently, 95% of the fuel ethanol produced is from corn. Pearl millet has great potential to supplement corn ethanol production in the Southeast. To meet production goals of 20 billion or more gallons of ethanol per year, it is essential for the ethanol industry to expand production of ethanol from ligno-cellulosic material. The majority of the effort has been on improving use of corn stover and switchgrass . However, for the Southern United States, perennial warm season forage grasses such as bermudagrass, and bunch grasses such as napiergrass and giant reed produce much more biomass. Giant reed has also been identified as an excellent source of fiber and as a potential replacement to hard woods for the paper and pulp industry. These grasses have high tolerance to abiotic stress and are fit for use on CRP land and have potential for being used to reclaim land contaminated with minerals such as phosphorus and heavy metals.

Improved Facilities to Induce Uniform Drought Stress to More Effectively Select for Improved Drought Tolerance

Crops grown in the Southeastern U.S. are subject to variable climate conditions from year to year, specifically to water stress during drought years. Yields and susceptibility to insect pests and pathogens (specifically Aspergillus flavus, the fungus that produces aflatoxin, in corn and peanuts) are correlated to the timing and severity of water stress during the growing season. While most crops have genetic variability for water-use efficiency, selection for improved performance under drought conditions is difficult due to the unpredictable nature of the weather from year to year. Measurements of rainfall during the growing season can not provide an accurate measure of drought stress on a crop due to the impact that timing of rainfall events can have on crop performance. The ability to control soil moisture is the key to subjecting a crop to a uniform drought stress that can be repeated over years to provide useful scientific data.

The CGBRU has limited access to facilities that can be used to induce uniform drought stress on a crop. The current system involves the use of plastic-covered shelters, which limit the impact of rainfall events on soil moisture under the covered area. These shelters have three major limitations: 1) Because of the architecture of the shelters they are too short to use for crops other than peanuts or forage and turf grasses, 2) The shelters must be drawn over the crop at the beginning of the drought stress and can not easily be moved, leaving the crop under greenhouse-like conditions for most of the growing season and exposing it to severe heat stress, which can confound evaluations of drought stress, and 3) The rain-out shelters do not provide adequate protection from water moving on or under the surface of the soil, which is especially a problem during heavy rainfall events. For these reasons, it is desirable to develop a new system for evaluating drought stress that can accommodate multiple crops, reduce the confounding effects of heat stress, and provide better control of soil moisture.

A more desirable system of rain-out shelters would be modeled on the system used by USDA researchers at Dawson, Georgia. The shelters at that location are automated to slide over the crop during a rainfall event, and then retract once the rainfall has ceased, so that the crop is exposed to normal environmental conditions during most of the growing season. The shelters also have concrete barriers on all sides buried down twelve feet into the ground, to prevent movement of water through the soil and provide researchers with complete control over soil moisture in the experimental plots. While the shelters at Dawson are tall enough only for peanuts, they provide an excellent example for development of a system that could be used in Tifton.

Safety and Health Report

The location has a Safety and Health Committee that conducts annual safety inspections, organizes safety training sessions, coordinates the Occupational Medical Surveillance Program, and oversees compliance on various federal and state programs with regulations concerning workplace safety and health. The Tifton Safety and Health Committee includes:

Thomas A. Hendricks, Chairperson - Chemist, Collateral Duty Safety Officer
Sally Belflower - Physical Science Technician (SEWRU)
Jeff Wilson - Research Plant Pathologist (CGBRU)
W. Carroll Johnson - Research Agronomist (CPMRU)
Tamara M. Snipes - Chemist, Chemical Hygiene Officer
James E. Carpenter - Research Entomologist, Radiological Protection Officer
Debbie Padgett - Administrative Officer, Administrative Management
Tim Strickland - Research Leader, SEWRU, Location Coordinator
Alton N. Sparks, Jr. - Chairperson, UGA-CAES-Tifton Campus Safety Committee

Personal protection equipment and fit-tested respirators are provided for CGBRU personnel. Annual safety training is required for all employees, and other training is provided as specific needs arise. Material Data Safety Sheets are maintained outside each laboratory, and a chemical inventory list is kept by the safety committee. The Tifton location underwent a Site Security Assessment performed by a Tiger Team in January, 2003. Security issues identified in the report have been addressed within the limits of available funding. The Research Leader and all supervisors are keenly aware of the importance of safety and health issues and respond promptly to correct noted deficiencies.

Environmental Management System Report

Executive Order 13148, "Greening of the Government through Leadership in Environmental Management", requires each federal agency to develop and implement an Environmental Management System (EMS) at its location. In April, 2005, the Tifton Location was instructed to name an EMS Coordinator, assemble a team, and develop a plan of action. Tamara Snipes was named as Tifton EMS coordinator and an EMS team was assembled and a policy statement was drafted. The Tifton EMS team includes:

Tamara Snipes, Chair, Chemist
Tom Hendricks, Chemist
Laura Marshall, Hydrologist
Kathy Marchant, Off Automation Clerk
Jacolyn Merriman,Bio Lab Technician
Tom Maze, Purchasing Agent
Tim Strickland, Location Coordinator
Patty Timper, Res Plant Pathologist
Lorine Lewis, Bio Sci Technician

The team is currently evaluating all phases of operation at Tifton with regards to our impact on the environment, both positive and negative. After identifying areas of impact, we will set goals to reduce, or eliminate, those which adversely affect the environment. We are already implementing numerous energy saving features in buildings and in fields.

EMS is continually evolving. Current goals will be replaced as new environmental issues arise and laws change. We have currently met all deadlines set by ARS and USDA and are making good progress in meeting goals already established.

Managerial Problems and Opportunities

Problem or opportunity:

The mechanics of acquiring funding for new initiatives is complex and requires partnership with diverse clientele who are committed to the process and want to see an expansion of programmatic effort by USDA-ARS. This will require an increase in the visibility of the programs of the CGBRU and a consistent effort to represent the research and solutions we provide to producers and the public.

Suggested solution:

The three ARS Research Units at Tifton have formed a Customer Liaison Committee to facilitate efforts to enhance ARS research at Tifton. This group has had an annual gathering in Tifton for the past two years. Additional gatherings (e.g. field days) are planned to exchange information and ideas that will aid in the formulation of priorities for research and in the communication of research results. Membership in the Liaison Committee should also be increased to broaden customer and stakeholder input.

CRIS Project 6602-21410-004-00D
Genetic Enhancement and Management of Warm-season Grass Species for Forage and Alternative Uses

Scientist / CRIS Scientific Effort
Jeffrey P. Wilson [Lead Scientist (100%)]
Andrea L. Maas (100%)
William F. Anderson (100%)
C. Corley Holbrook (10%)

Accomplishments (past 3 years)

Perennial Forage Grasses
A new faster germinating bahiagrass cultivar (TifQuik) is scheduled for release in 2007. With this cultivar, pastures will be established faster to reduce weed competition and enhance early hay production or grazing. It will also provide options for farmers in establishment of bahiagrass pastures and in rotational management of row crops such as peanut and cotton for the control of yield-reducing nematodes. TifQuik has completed three years of testing and is in multi-location and grazing trials. TifQuik has been approved for joint release by USDA/ARS and the University of Georgia.

Improved sprigged and seeded bermudagrass hybrids from the program are in multi-year and multi-location testing for yield, persistence, and quality.

A core collection of 170 bermudagrass accessions has been developed to more fully evaluate characteristics for forage and biofuel feedstocks. The core collection has been assessed for in vitro dry matter digestibility (IVDMD) and fiber traits. Near infrared spectroscopy (NIRS) was calibrated with wet chemistry results of fiber and digestibility for a much more efficient method of determining quality of forage bermudagrass breeding lines. The core is presently being evaluated for fall armyworm resistance, abiotic stresses, seed setting ability and genetic variation via molecular genotyping (AFLP) which will lead to the identification of new parents and improved methods for use in breeding bermudagrass cultivars.

Bio-Fuel Feedstocks
Pearl millet was found to be a promising feedstock for ethanol production. Compared to corn, pearl millet fermented 30% faster and the DDGS coproduct had a greater nutritional and economic value as measured by protein and fat content. The DDGS should also have lower concentrations of aflatoxins or fumonisins, since pearl millet is less susceptible than corn to contamination by these carcinogenic mycotoxins.

A giant reed collection and has been developed. Very little genetic difference has been found among the clones using AFLP analyses. However, a 100 accession napiergrass collection has been found to have considerable phenotypic and genetic variability.

Early studies indicate that bermudagrass may have greater yield potential for conversion to

ethanol than switchgrass. Bermudagrass cultivar Tifton 85 had the highest reduction of dry matter to fermentable sugars and highest amount of released ferulic acid co-product using environmentally friendly enzymatic pretreatments. Napiergrass showed high potential for reduction of dry leaf matter to fermentable sugars for ethanol production.

Pearl Millet

Accomplishments of the project include the development and transfer of new technologies and associated management information, to the agribusiness community. Pearl millet hybrid Tifgrain 102 was released for commercial production in 2004, and information for production and use has been widely distributed to diverse industries, including farmers, recreational wildlife managers, poultry producers, seed companies, and the ethanol industry at field days, grower training meetings, and agricultural conferences and workshops.

SSR and EST primers were used to assess genetic diversity in a collection of wild, exotic, and domestic pearl millet accessions. The U.S. accessions were differentiated from the wild and exotic germplasm, which were less clearly differentiated. Clusters may identify potentially diverse sources of genes for crop improvement.

Advances were made in identifying resistance and tolerance to biotic and abiotic stresses. A maize resistance gene analog PIC 13 (derived from rp3 rust resistance gene) was found to co-segregate with rust resistance in one pearl millet inbred, and is linked 2.4 cm with two other resistance genes. PIC 13 may be useful to conduct marker assisted selection for these rust resistance genes. The "staygreen" trait is associated with drought tolerance in grasses. A pearl millet selection with staygreen was identified and a quantitative assay was developed to compare genotypes. This research is likely to provide greater drought tolerance, improved nitrogen use efficiency, and greater protein content of forage. Chinch bug tolerance was identified in two pearl millet inbreds. Chinch bug is the primary insect pest of this forage grass and resistance will contribute to the stability of production in pastures. New sources of resistance to root knot nematode has been identified in African pearl millet germplasm. The resistance makes pearl millet more valuable in crop rotations.

Jeffrey P. Wilson, Research Plant Pathologist (Lead Scientist)

Progress:
Research enhances the rural economy and environment, through diversifying cropping systems to benefit row crop farmers, livestock producers, agritourism, and the broiler, layer, and developing ethanol industries. Regional and international research targets improved pearl millet genetics, management systems and utilization.

Advances were made in identifying resistance and tolerance to biotic and abiotic stresses. The "staygreen" trait is associated with drought tolerance in grasses. A staygreen pearl millet was identified and a quantitative assay was developed to compare genotypes. This research will provide greater drought tolerance, improved nitrogen use efficiency, and greater protein content of forage. Tolerance to chinch bug (*Blissus leucopterus*) was identified in two pearl millet inbreds. Chinch bug is the primary insect pest of this forage grass and resistance will contribute to the stability of production in pastures. New sources of resistance to root knot nematode (*Meloidogyne incognita*) has been identified in African pearl millet germplasm. The resistance makes pearl millet more valuable in crop rotations.

SSR and EST primers were used to assess genetic diversity in a collection of wild, exotic, and domestic pearl millet accessions. The U.S. accessions were differentiated from the wild and exotic germplasm, which were less clearly differentiated. Clusters may identify potentially diverse sources of genes for crop improvement.

A maize resistance gene analog PIC 13 (derived from Rp3 rust resistance gene) was found to co-segregate with resistance to rust (*Puccinia substriata* var. *indica*) in one pearl millet inbred, and is linked 2.4 cm with two other resistance genes. PIC 13 may be useful to conduct marker assisted selection for these rust resistance genes.

Pearl millet hybrid Tifgrain 102 was released for commercial production in 2004, and information for production and use has been widely distributed to diverse industries, including farmers, recreational wildlife managers, poultry producers, seed companies, and the ethanol industry at field days, grower training meetings, and agricultural conferences and workshops.

Pearl millet was found to be a promising feedstock for ethanol production. Compared to corn, pearl millet fermented 30% faster and the DDGS coproduct had a greater nutritional and economic value as measured by protein and fat content. The DDGS should also have lower concentrations of aflatoxins or fumonisins, since pearl millet is less susceptible than corn to contamination by these carcinogenic mycotoxins.

Plans:
Upcoming research plans include evaluation of new forage hybrids for dry matter yield, forage quality, and new grain hybrids for grain, protein, and ethanol yield, and compatibility in conventional, no-till, and organic production systems in both the coastal plain and piedmont regions of the state. New germplasms will be introduced from Africa and Asia, and will be

evaluated for resistance to pests including rust, pyricularia leaf spot, root knot nematodes, chinch bug, and in international collaborative trials, downy mildew and striga. Breeding approaches will be developed to transfer new forage and grain quality traits, staygreen, and resistance to diseases and pests into elite germplasms with good combining ability for the development of new hybrids. A genetic mapping population will be assessed for identifying molecular markers linked with difficult-to-screen for traits necessary for pearl millet improvement.

Cooperators:

USDA-Agricultural Research Service:

William Anderson, Tifton, GA
Scott Bean, Manhattan, KS
Andrea Maas, Tifton, GA
Andrew McAloon, Wyndmoor, PA
Xinzhi Ni, Tifton, GA
Thomas Potter, Tifton, GA
Harry Schomberg, Watkinsville, GA
Patricia Timper, Tifton, GA
Clint C. Truman, Tifton, GA
Theodore Webster, Tifton, GA

University

David Buntin, University of Georgia, Griffin, GA
Emily Cantonwine, University of Georgia, Tifton, GA
Peng Chee, University of Georgia, Tifton, GA
Nick M. Dale, University of Georgia, Athens, GA
Katrien Devos, University of Georgia, Athens, GA
Ronald Gitaitis, University of Georgia, Tifton, GA
Surinder Gulia, Fort Valley State University, Fort Valley, GA
Wayne W. Hanna, University of Georgia, Tifton, GA
Chris Little, University of Texas - Pan American, Edinburg, TX
Bryan Maw, University of Georgia, Tifton, GA
George Shumaker, University of Georgia, Statesboro, GA
Donghai Wang, Kansas State University, Manhattan, KS

Industry

Milton Brooks, Elmodel Quail
Jimmy Clements, Plantation Seed Conditioners, Newton, GA
Steve Enfinger, Plantation Seed Conditioners, Newton, GA
Mark Schonbeck, Virginia Association for Biological Farming
Relinda Walker, Georgia Organics
Karl Wardlow, Coffey Forage Seeds, Plainview, TX

International

Issaka Ahmadou, INRAN, Niger
Ignatius Angarawai, LCRI, Nigeria

Michael Ayliffe, CSIRO, Australia
Amadou Fofana, ISRA, Senegal
C. Tom Hash, ICRISAT, India
V. N. Kulkarni, ICRISAT, India
Isaac Mbaiwa, DAR, Botswana
Ferdinand P. Muuka, Zambia
Stephen Nutsugah, SARI, Ghana
K. N. Rai, ICRISAT, India
Moussa Sanogo, IER, Mali

Peer-reviewed publications (2003-2006):

Lynch, R.E., B. Guo, P. Timper, and **J.P. Wilson**. 2003. United States Department of Agriculture-Agricultural Research Service research on improving host-plant resistance to pests. Pest Management Science 59:718-727.

Wilson, J.P., R.N. Gates, and W.W. Hanna. 2004. Strip-till establishment of pearl millet. International Sorghum and Millets Newsletter 44:158-159.

Wilson, J.P., C.C. Holbrook, B. Mandal, D.L. Rowland, M.L. Wells, and D.M. Wilson. 2004. Efficacy of foliar applications of particle films and genotype for managing thrips, diseases, and aflatoxin in peanut. Online. Plant Health Progress doi: 10.1094/PHP-2004-0419-01-RS.

Wilson, J.P., D.E. Hess, W.W. Hanna, K.A. Kumar, and S.C. Gupta. 2004. *Pennisetum glaucum* subsp. *monodii* accessions with striga resistance in West Africa. Crop Protection 23:865-870.

Wilson, J.P. and K.M. Devos. 2004. Linkage groups associated with partial rust resistance in pearl millet. International Sorghum and Millets Newsletter 45:51-52.

Dahlberg, J., **J.P. Wilson**, and T. Snyder. 2004. Sorghum and pearl millet-health foods and industrial products in developed countries. Pgs. 42-59 in: Alternative Uses of Sorghum and Pearl Millet in Asia. International Crops Research Institute for the Semi-Arid Tropics. Patancheru 502 324, Andhra Pradesh, India: 364 pp. ISBN 92- 9066-471-1. (Book Chapter)

Awala, S.K. and **J.P. Wilson**. 2005. Expression and segregation of stay-green in pearl millet. International Sorghum and Millets Newsletter. 46:87-100.

Jurjevic, Z., D.M. Wilson, **J.P. Wilson**, D.M. Geiser, J.H. Juba, W, Mubatanhema, G.C. Rains, and N. Widstrom. 2005. *Fusarium* species of the *Gibberella fujikuroi* complex and fumonisin contamination of pearl millet and corn in Georgia, USA. Mycopathologia 159:401-406.

Hanna, W., **J. Wilson**. and P. Timper. 2005. Registration of pearl millet parental line Tift 454. Crop Science 45:2670.

Hanna, W., **J. Wilson**. and P. Timper. 2005. Registration of pearl millet parental lines Tift 99D2A1/B1. Crop Science 45:2671.

Timper, P. and **J.P. Wilson**. 2006. Root-knot nematode resistance in pearl millet from West and East Africa. Plant Disease 90:339-344

Wang, D., X. Wu, S. Bean, and **J.P. Wilson**. 2006. Ethanol production from pearl millet by using *Saccharomyses cerevisiae*. Cereal Chemistry 83:127-131.

Wilson, J.P., Z. Jurjevic, W.W. Hanna, D.M. Wilson, T.L. Potter, and A.E. Coy. 2006.Host-specific variation in infection by toxigenic fungi and contamination by mycotoxins in pearl millet and corn. Mycopathologia 161:101-107.

Non-peer-reviewed publications (2003-2006):

Lee, D., W.W. Hanna, G.D. Buntin, W. Dozier, P. Timper, and **J.P. Wilson**. 2004. Pearl Millet for Grain. University of Georgia Cooperative Extension Service Bulletin 1216 (Revised). 8 pp. (Extension Service bulletin)

Angarawai I.I, **J. Wilson**, W.B. Ndahi, and Z.G.S. Turaki, Z.G.S. Enhancing resource - poor farmers productivity by pearl millet hybrids. pg 60-61. Proceedings: Millet and Sorghum-Based Systems in West Africa: Current Knowledge and Enhancing Linkages to Improve Food Security. McKnight Foundation Collaborative Crop Research Foundation. Niamey, Niger, January 27-30, 2004.

Chee, P. and **J.P. Wilson**. 2004. Genetic variability of wild pearl millets with striga resistance. pg 65-66. Proceedings: Millet and Sorghum-Based Systems in West Africa: Current Knowledge and Enhancing Linkages to Improve Food Security. McKnight Foundation Collaborative Crop Research Foundation. Niamey, Niger, January 27-30, 2004.

Wilson, J.P. 2004. Breeding pearl millet for improved stability, performance, and pest resistance. International Sorghum and Millet CRSP 2003 Annual Report, INTSORMIL publication 03-06. pg. 73-76. (Technical report)

Wilson, J.P., C.C. Holbrook, L. Wells, B. Mandal, D. Rowland, and D.M. Wilson. 2004. Effect of foliar application of particle films on drought stress and aflatoxin contamination of peanut. Mycopathologia 157:477 (Conference proceedings).

Wilson, J.P., W.W. Hanna, D.M. Wilson, and A.E. Coy. 2004. Host specific differences in preharvest grain infection by toxigenic fungi in dryland pearl millet and corn. Mycopathologia 157: 503. (Conference proceedings)

Wilson, J.P. 2005. Breeding pearl millet for improved stability, performance, and pest resistance. International Sorghum and Millet CRSP 2004 Annual Report, INTSORMIL publication 03-06. pg. 63-67. (Technical report)

Wilson, J.P. 2005. Does Forage Pearl Millet Have a Place in Production Systems of Central America? Proceedings of the Central America Regional Workshop on Forage Sorghum and Millet. San Miguel, El Salvador. Nov 16-18, 2005. (CD-ROM)

Wilson, J.P., P. Timper, C.C. Truman, N.M. Dale, A.B. Batal, X. Ni, R. Gitaitis, A.J.McAloon, G. Shumaker, G. Dowling, J. Brown, T. Webster, and A. Maas. 2006. Economics-driven research and incentives for pearl millet production in the United States. Proceedings of the International Training Course on Pearl Millet Improvement and Seed Production. ICRISAT, Hyderabad, India. May 2-15, 2006. (CD-ROM)

Education:

Ph.D.	1987. Plant Pathology. Purdue University
M.S.	1985. Plant Pathology. Purdue University
B. S.	1982. Plant Science. Purdue University

Employment:

1987-1988	Post-doctoral Plant Pathologist, USDA-ARS-SAA, Forage and Turf Research Unit. Tifton, GA (GS 11)
1988-1992	Research Plant Pathologist, USDA-ARS-SAA, Forage and Turf Research Unit. Tifton, GA (GS 12)

1992-2000	Research Plant Pathologist, USDA-ARS-SAA, Forage and Turf Research Unit, Tifton, GA (GM-13)
2000-2004	Research Plant Pathologist, USDA-ARS-SAA, Crop Genetics and Breeding Research Unit, Tifton, GA (GM-13)
2004-present	Research Plant Pathologist, USDA-ARS-SAA, Crop Genetics and Breeding Research Unit, Tifton, GA (GS-14)

Professional Societies and Service:

American Phytopathological Society

Southern Division American Phytopathological Society

- Associate Editor for Phytopathology 1992-1994
- Associate Editor for Plant Disease 1999-2001
- Senior Editor for Phytopathology (Genetics and Resistance section), 2003-2005
- Southern Division Finance and Promotion Committee, Member (1992-1993), Chair (1993-1994)
- Collections and Germplasm Committee - Member (1991-1993), Vice Chair (1994), Chair (1995), Member (2000-2001), Vice Chair (2002), Chair (2003)
- Host Resistance Committee - Member (1992-1994) and (1997-1999)
- Office of International Programs, Research Advisory Committee - Member (2002-2005)
- Tropical Plant Pathology Committee - Member (2003-2005)

Miscellaneous

- Member, Sorghum and Millet Crop Germplasm Advisory Committee (2002-present)

Awards:

Dow Chemical Company; Graduate student scholarship for plant protection research in Purdue University's College of Agriculture. 1986

North Central Division, American Phytopathological Society, Second place, graduate research competition. 1987

E.I. DuPont de Nemours and Company; Graduate student scholarship in Purdue University's Dept. Botany and Plant Pathology. 1987

Sigma Xi Tifton Chapter; Creative research award. 1998

Georgia Association of Plant Pathologists; Outstanding presentation. 1998

American Phytopathological Society; Recognition of outstanding service as Plant Disease Associate Editor. 2001

USDA-ARS-Office of International Research Programs; Certificate of merit for exceptional efforts in support of early career South African Internship Program. 2004

USDA-ARS-SAA; Superior performance. 1999, 2000, 2002, 2003, 2005

USDA-ARS-SAA; Outstanding performance. 1996, 2001, 2004

Member, Sigma Xi, Scientific Research Society

Member, Phi Kappa Phi, National Honor Society

Member, Gamma Sigma Delta, Honor Society of Agriculture

Extramural funding:

Principal investigator. **Wilson, J.P.** Breeding pearl millet with improved yield, stability, and resistance to pests. International Sorghum and Millet Collaborative Research Support Program. $295,000. 2002-2006.

Principal investigator. Wilson, J.P. and Nutsugah, S.K. Identifying sources of resistance to grain molds and mycotoxins in pearl millet. USDA-Foreign Agricultural Service. $45,000. 2006-2008

Andrea L. Maas, Research Geneticist

Progress:

Continuation of current pearl millet breeding projects for the development of new forage cultivars and potential alternate uses. Evaluation of new grain hybrids for yield as potential biofuel stocks, assessment of sources for improved hybrid production, assessed pearl millet plants for improved nutrient, insect and disease resistance characteristics to be used in new hybrids. Increased diversity of plant species being assessed for forage and biofuel niche markets and reduced production costs of high quality forages.

Plans:

Studies for the improvement of water and nitrogen use efficiency have been initiated. These studies include salinity tolerance of bermudagrass to allow the use of grey water and other lower quality water sources for irrigation. Studies of multiple legume species to increase nitrogen use efficiency in forages and biomass production systems will be conducted. Perennial peanut will be assessed for winter hardiness to assess potential to provide a high quality warm season forage legume for growing zones 8a and 7b through collaboration with Twain Butler of the Noble Foundation. Improvement of forage quality by the use of brown midrib trait in pearl millet and napiergrass for usage as livestock feed and biofuel production will be conducted.

Cooperators:

USDA-Agricultural Research Service:

Jeffrey P. Wilson, Tifton, GA
William F. Anderson, Tifton, GA
Xinzhi Ni, Tifton, GA
C. Corley Holbrook, Tifton, GA
Matthew D. Krakowsky, Tifton, GA
Roy N. Pittman, Griffin, GA
Kelly D. Chenault, Stillwater, OK

University:

Wayne W. Hanna, University of GA, Tifton, GA
Albert K. Culbreath, University of GA, Tifton, GA

Industry:

Coffey Forage Seeds, Inc., Plainview, TX

Other:

Twain Butler, The Noble Foundation, Ardmore, OK

Peer-reviewed publications (2005-2006):

Maas, A.L., K.E. Dashiell, and H.A. Melouk. 2006. Planting density influences disease incidence and severity of Sclerotinia blight in peanut. Crop Science. 46:1341-1345.

Maas, A.L., K.E. Dashiell, and H.A. Melouk. Removal of apical dominant shoot for disease resistance screening increases seed yield of container-grown plants. Crop Science. (Accepted April 11, 2006)

Maas, A. L, and W.W. Hanna. Cover crop affects nitrogen response of pearl millet grain production in a strip-till system. International Sorghum and Millets Newsletter. (In review).

Non-peer-reviewed publications (2005-2006)

Chenault, K.D., and **A.L. Maas**. 2006. Identification of a simple sequence repeat (SSR) marker in cultivated peanut (*Arachis hypogaea* L.) potentially associated with Sclerotinia blight resistance{abstract}. Proceedings of the American Peanut Research and Education Society. 37:24-25.

Maas, A.L. and W.W. Hanna. 2006. Cover crop affects nitrogen response of pearl millet grain production in a strip-till system. 2006 American Society of Agronomy Southern Branch Meeting Abstracts [CD-ROM]. ASA, Madison, WI.

Maas, A.L., C.Nischwitz, and A.K. Culbreath. First report of peanut mottle virus (PMV) in rhizoma peanut. (Submitted to Proceedings of the American Peanut Research and Education Society).

Maas, A.L. and W.W. Hanna. Planting date affects grain yield and height of TifGrain 102 pearl millet in the southeastern Coastal Plain. (Submitted to 2006 Annual Meetings, ASA,CSSA, and SSSA, Madison, WI)

Education:

Ph.D. 2005. Crop Science. Oklahoma State University
M.S. 1997. Plant Breeding and Genetics-Crop and Soil Sciences. Michigan State University.
B.S. 1994. Agricultural Sciences. Michigan State University.

Employment:

2005-present. Research Geneticist. USDA-ARS, Crop Genetics and Breeding Unit, Tifton GA (GS-12)
2002-2005 Graduate Teaching Assistant. Plant and Soil Sciences Department, Oklahoma State University, Stillwater, OK
1997-1999 Production Research Agronomist. HybriTech US, Boise, ID
1994-1996 Graduate Research Assistant. Department of Crop and Soil Sciences, Michigan State University, East Lansing, MI

Professional Societies and Service:

Crop Sciences Society of America, 1997-present.
Gerald O Mott Scholarship Committee. 2006-2007
American Peanut Research and Education Society, 2006
Sigma Xi, The Scientific Research Society. 2006

William F. Anderson, Research Geneticist

Progress:

A quick germinating improved bahiagrass has been tested over three years and at multiple locations, and is currently in a grazing trial. Approval for PVP and joint release of the cultivar (TifQuik) has been granted by ARS and the University of Georgia. This cultivar will be valuable to growers for fast emergence in the field for permanent pasture or within a sod-based rotation system where the benefit to row-crop growers will be a reduction in nematode and disease problems with peanut and cotton. Improved seeded and sprigged bermudagrass hybrids are being tested for yield, cold tolerance and quality at multiple locations in Georgia and Florida with possible release in the near future. A 168 bermudagrass core collection has been established from the over 600 accessions present in Tifton. The core collection has a size that is conducive to replicated testing. The core collection has been evaluated for digestibility and fiber attributes, is currently being evaluated for fall armyworm resistance and abiotic stresses. We are also assessing the genetic variability of this core collection through use of Amplified Fragment Length Polymorphisms (AFLP).

Multiple semi-tropically species are being evaluated for use as biomass feedstocks for the bio-energy industry. Switchgrass is being compared with napiergrass, sugar or energy cane, giant reed and Miscanthus for yield and quality traits in Tifton. Work is in collaboration with Federal, state and private researchers.

Plans:

The goal of the project is to increase rural farmer income and expand marketability of forages in the Southeast. Increasing returns, reducing inputs, and identifying new uses such as in fuel and fiber industries will be the means to these goals. Improved bermudagrass germplasm will be developed and tested that will attempt to improve ease of establishment, persistence, maintenance, yield and quality for multiple uses. This will be done through traditional methods and with the use of marker assisted breeding technologies. Near-infrared spectroscopy (NIR) will be utilized for faster evaluation of quality traits for more efficient means of breeding. Over-seeding present and experimental bermudagrass genotypes with annual or perennial legumes and use of chicken litter will be investigated to reduce nitrogen fertilizer inputs.

Dedicated energy crops will be determined and two or three species will be targeted for improvement in yield and for changes in cell wall structure that will make the crops more amenable for use in fuel and fiber. Techniques developed for switchgrass as well as new and unique methods of analysis will be used in collaboration with researchers at other locations for the improvement of traits to reduce recalcitrance of plant tissue and increase bio-fuel yields.

Cooperators:

USDA-Agricultural Research Service:

Jeffrey P. Wilson, Tifton, GA
Andrea Maas, Tifton, GA
Xinzhi Ni, Tifton, GA
C. Corley Holbrook, Tifton, GA
Matthew D. Krakowsky, Tifton, GA
Roy N. Pittman, Griffin, GA

Kelly D. Chenault, Stillwater, OK
Dan A. Akin, Athens, GA
David S. Himmelsbach, Athens, GA
Franklin (Woody) Barton, Athens, GA
Bruce Dien, Peoria, IL
Gary Banowetz, Corvalis, WA
Akwasi Boateng, Wyndmoor, PA
Hans Jung, St. Paul, MN

University:
Wayne W. Hanna, University of GA, Tifton, GA
Albert K. Culbreath, University of GA, Tifton, GA
Gary Hill, University of GA, Tifton, GA
Joy Peterson, University of GA, Athens, GA
Ann Blount, University of Florida, Marianna, FL

Industry:
Coffey Forage Seeds, Inc., Plainview, TX

Other:
Twain Butler, The Noble Foundation, Ardmore, OK

Peer-reviewed publications (2003-2006):

Timper, P., C.C. Holbrook, and **W.F. Anderson**. 2003. Reproduction of *Meloidogyne* spp. on resistant peanut genotypes from three breeding programs. J. Nematology 35(4):417-421.

Anderson, W.F., G. Kochert, C.C. Holbrook, and H.T. Stalker. 2004. Phenotypic and molecular evaluation of interspecific peanut (*Arachis)*lines. Peanut Sci. 31:65-70.

Anderson, W.F. 2005. Development of a forage bermudagrass (Cynodon sp.) core collection. Grassland Sci. 51:305-308.

Anderson, W.F. and J.E. Harvey. 2005. Registration of AT '3081R' Peanut. Crop Sci. (accepted).

Anderson, W.F., C.C. Holbrook, and P. Timper. 2006. Registration of root-knot nematode resistant peanut germplasm lines NR 0812 and NR 0817. Crop Sci. 46:481-482.

Anderson, W. F., J. Peterson, D.E. Akin, W. H. Morrison, III. 2005. Enzyme pretreatment of grass lignocellulose for potential high-value co-products and an improved fermentable substrate. Appl. Biochem. Biotechnol. 121-124:303-310.

Non-peer-reviewed publications (2003-2006)

Akin, D. E., W. H. Morrison III, and **W. F. Anderson**. 2004. Lignocellulose of grasses: Potential for bioenergy and co-products. Division of Cellulose and Renewable Materials for the 227th ACS National Meeting, Anaheim, CA, March 28-April 1, 2004 in Anaheim (from 03-28-2004 to 04-01-2004) (Abstr.)

Anderson, W.F., D.E. Akin, D.S. Himmelsbach, W. H. Morrison, III, D.Bransby, and R. Cobill. 2005. Potential perennial biomass feedstocks for Southern United States. 27th Symposium on Biotechnology for Fuels and Chemicals (May 1-4). (Abstr.: p. 50).

Anderson, W.F., G.W. Burton, W.W. Hanna, and M. Davis. 2004. Coastcross II bermudagrass. Proceedings of the Conference of American Forage and Grassland Council (AFGC), June 12-16, Roanoke, VA. 13:526.

Anderson, W.F., R.N. Gates, W.W. Hanna, and A.R. Blount. 2005. Rapid germinating forage bahiagrass. Agron. Abstr. 2005. (CD Rom).

Anderson, W.F., and M.B. Parker. 2005. Yield and mineral element composition of Tifton 85 and Coastal bermudagrass in relation to fertilizer application. Proceedings of the Conference of American Forage and Grassland Council (AFGC), June 11-15, Bloomington, IL. 14:115.

Anderson, W.F., P. Ozias-Akins, and M. Snook. 2004. Initial genotyping of bermudagrass plant accessions using genetic and chemical approaches. Keystone Symposium: Comparative Genomics of Plants. March 4-9, 2004. Taos, NM (Abstr.).

Anderson, W.F., and M. Snook. 2004. Development of a bermudagrass core collection. Agron. Abstr. 2004. (CD Rom)

Invited Talks:

Invited and presented talks to Chinese and Brazilian scientific and political delegations on perennial grass forage genetics, production, and management (March 22 and March 26, 2004)

Invited and presented talk "Bermudagrass Varieties and Management" to UGA sponsored Grazing School (April 5, 2004)

Invited and presented talk "Grass Forages for South Georgia" to Tift County Cattlemen's Association (January 11, 2005)

Invited and presented seminar "Breeding of Perennial Grasses for Forage and Bio-fuel" as part of University Adjunct procedure at Athens, GA. (December 9, 2005) and for Sigma Xi at Tifton, GA. (January 5, 2006)

Invited and presented talk "Potential Bio-fuel Production in Georgia" to Laurens County Extension and local growers (February 9, 2006)

Invited and presented seminar "Improvement of Perennial Warm-Season Grasses for Forage and Bio-fuels" at Albany State University (March 28, 2006)

Invited and presented seminar "Perennial Grass Breeding Program for Forage and Bio-fuels – Tifton" at the Southern Pasture and Forage Conference at Auburn, AL (April 13, 2006)

Offices and Committee Assignments in Honorary and Professional Societies

Member - C456 NCCPB Genetics and Plant Breeding Award for Industry Committee - Crop Science Society of America, 2004-2006.

Member - Forage and Turf Crop Germplasm Committee (CGC), 2003 – present

Member – Diversity in the Workplace Committee - USDA/ARS, Tifton, 2004-present

Education:

Ph.D. 1989	Crop Science, North Carolina State University
M.S. 1985	Crop Science, North Carolina Sate University
B.S. 1977	Biochemistry, University of New Hampshire

Employment:

2003-present	Research Geneticist, USDA-ARS, Crop Genetics and Breeding Research Unit, Tifton, GA.
1998-2002	Biotech Research Coordinator and Plant Breeder, AgraTech Seeds, Inc., Ashburn, GA.
1997-1998	Transgenic Cotton Breeder, Stoneville Pedigreed Seed Company, Leland, MS.
1994-1997	Post Doctorate, University of Georgia Department of Botany, Athens, GA.
1990-1994	Post Doctorate, University of Georgia, Department of Agronomy, Tifton, GA.

Memberships in Professional Societies

American Peanut Research and Education Society
Crop Science Society of America
Gamma Sigma Delta Honor Society

CRIS Project: 6602-21220-012-00D
Genetic Improvement of Maize and Pearl Millet for Resistance to Insects and Aflatoxin

Scientists/CRIS Scientific Effort
Matthew Krakowsky [Lead Scientist (100%)]
Xinzhi Ni (100%)
C. Corley Holbrook (10%)

Accomplishments:

Evaluation of *Aspergillus flavus* inoculation methods. Different methods for inoculating corn with *A. flavus* are used by different researchers, but comparisons between methods have not been made. In Georgia, methods that deposit the fungus inside the husk in the middle of the ear were most effective.

Mapping of QTL for Southern Leaf Blight. This research was conducted in collaboration with a USDA-ARS researcher at Raleigh, NC, and involved mapping of QTL for southern leaf blight in corn. The disease can result in significant yield losses when infection occurs before flowering. Genes mapped in this study can be transferred into susceptible germplasm for validation and potential incorporation into susceptible elite breeding lines.

Field screening for multiple ear-feeding insect resistance in experimental corn hybrids and inbred lines. Ten experimental hybrids and 10 of the parental inbred lines that confer corn earworm resistance have been continuously screened for maize weevil, and stink bug (i.e., brown stink bug and southern green stink bug) resistance. We identified two hybrids and two inbred lines that confer resistance to all four species of ear-feeding corn insects.

Field evaluation of pearl millet for chinch bug (Heteroptera: Blissidae) resistance. Sixteen pearl millet entries (including both hybrids and inbred lines) were screened for chinch bug resistance using stunting, necrosis, dead tiller percentage, and stand loss of the plants. Planting of Dove proso millet could be used as an effective trap crop strip to establish natural infestation of chinch bugs for the screening. Three entries were identified as the most resistant, and three entries were also categorized as the most susceptible to chinch bug feeding.

Matthew Krakowsky, Research Geneticist (Lead Scientist)

Progress:

Dr. Krakowsky has been conducting research on corn at the Tifton location for almost three years, focusing primarily on pre-harvest aflatoxin contamination. He has evaluated methodologies for inoculating corn with *Aspergillus flavus*, the fungus that produces aflatoxin, and screened germplasm for resistance to aflatoxin contamination in collaboration with other researchers in the southern U.S. Several genetic studies of resistance to aflatoxin are underway, with the goal of identifying genes for resistance that can be incorporated into elite breeding lines for use in commercial hybrids. Dr. Krakowsky has performed studies on the effects of biotic stresses on pre-harvest aflatoxin contamination of corn. He is also conducting studies on other important agronomic traits in the southern U.S.

Plans:

Once identified, new sources of resistance to aflatoxin contamination will be crossed with elite breeding lines to develop new populations for selection. Genes for resistance will be identified and transferred via marker-assisted selection (MAS) to susceptible germplasm for validation. As germplasm currently identified as resistant to aflatoxin contamination is not agronomically acceptable for other traits, methodologies for inoculating germplasm with *A. flavus* will be refined to allow for more quantitative ratings of germplasm. This should facilitate identification of germplasm with partial resistance to aflatoxin contamination and good agronomic traits which can more easily be incorporated into breeding programs. Dr. Krakowsky will also collaborate with other USDA and University scientists to identify germplasm with good silage traits and adaptation to the southern U.S.

Cooperators:

USDA-Agricultural Research Service:

Xinzhi Ni, Tifton, GA
William F. Anderson, Tifton, GA
Jeffrey P. Wilson, Tifton, GA
Patricia Timper, Tifton, GA
Baozhu Guo, Tifton, GA
Richard Davis, Tifton, GA
Dana Sullivan, Tifton, GA
W. Paul Williams, Starkville, MS
Thomas Brooks, Starkville, MS
Gary L. Windham, Starkville, MS
Peter Balint-Kurti, Raleigh, NC

University:

R. Dewey Lee, University of Georgia, Tifton, GA
Javier Betran, Texas A&M University, College Station, TX
Georgia Davis, University of Missouri, Columbia, MO

International:

Suketoshi Taba, International Center for the Improvement of Maize and Wheat, El Batan, Texcoco, Mexico

David Bergvinson, International Center for the Improvement of Maize and Wheat, El Batan, Texcoco, Mexico

Peer reviewed journal publications (2003-2006)

Krakowsky, M.D., H.H. Beeghly, J.G. Coors, M. Lee. 2003. Characterization of quantitative trait loci affecting fiber and lignin in maize (*Zea mays* L). Maydica 48:283-292.

Krakowsky, M.D., M. Lee, W.L. Woodman-Clikeman, M.J. Long, N. Sharopova. 2004. QTL mapping of resistance to stalk tunneling by the European corn borer in RILs of maize population B73 x De811. Crop Science 44:274-282.

Krakowsky, M.D., M. Lee, J.G. Coors. 2005. Quantitative trait loci for cell wall components in recombinant inbred lines of maize (*Zea mays* L.) I: stalk tissue. Theoretical and Applied Genetics 111:337-346.

Krakowsky, M.D., M. Lee, J.G. Coors. 2006. Quantitative trait loci for cell wall components in recombinant inbred lines of maize (*Zea mays* L.) II: leaf sheath tissue. Theoretical and Applied Genetics 112:717-726.

Taba, S., J. Diaz, C.F. Aragon, F. Rincon-Sanchez, J.M. Hernandez, and **M.D Krakowsky.** In press. Evaluation of *Zapalote chico* accessions for conservation and enhancement. Accepted August 12, 2005 for publication in Maydica.

Balint-Kurti, P.J., **M.D. Krakowsky,** M.P. Jines, L.A. Robertson, R.K. Baesman, M.M. Goodman, and J.B. Holland. In press. Identification of quantitative trait loci for resistance to southern leaf blight of maize. Accepted January 31, 2006 for publication in Phytopathology

Krakowsky, M.D., M. Lee, L. Garay, W.L. Woodman-Clikeman, M.J. Long, N, Sharopova, B. Frame, and K. Wang. In press. Quantitative trait loci for cell totipotency in maize (*Zea mays* L.). Accepted April 27, 2006 for publication in Theoretical and Applied Genetics.

Non-peer reviewed publications (2003-2006)

Krakowsky, M.D. and N.W. Widstrom. 2003. Evaluation of corn hybrids for resistance to Insects, pp 37. In: A.E. Coy, J. L. Day and P.A. Rose (eds.) Georgia 2003 Corn Performance Tests, Research Report 690, Georgia Agricultural Experiment Stations, Athens, GA. (Technical Report).

Taba, S., **M.D. Krakowsky**, M. Rivas, M. Rodriguez, and J. Diaz. 2003. CIMMYT's Maize Prebreeding Program. International Symposium on Plant Breeding, August, 2003. (Abstr.)

Krakowsky M.D. and S. Taba. 2003. CIMMYT's Maize Prebreeding Program. American Society of Agronomy Annual Meeting, November, 2003. (Abstr.)

Krakowsky M.D. and S. Taba. 2004. CIMMYT's Maize Prebreeding Program. NCR-167 Corn Breeder's Meeting, February, 2004. (Abstr.)

Brooks, T., **M.D. Krakowsky**, W.P. Williams, and G.L. Windham. 2004. Further investigation of resistance mechanisms responsible for reduced levels of aflatoxin accumulation in maize: QTL studies of two resistant inbreds. Multicrop Aflatoxin/Fumonison Elimination and Fungal Genomics Workshop, October, 2004. (Abstr.)

Moore, S., H.K. Abbas, B. Buo, **M.D. Krakowsky**, M.J. Clements, T. Brooks, W.P. Williams, G.L.Windham, D. White, W. Xu, T. Isakeit, and J. Betran. 2004. Southeastern Regional Aflatoxin Test (SERAT). Multicrop Aflatoxin/Fumonison Elimination and Fungal Genomics Workshop, October, 2004. (Abstr.)

Krakowsky M.D., X. Ni, R. F. Davis, K. Da. 2005. Correlations between biotic stresses and aflatoxin contamination in corn. Multicrop Aflatoxin/Fumonison Elimination and Fungal Genomics Workshop, October, 2005. (Abstr.)

Brooks, T., **M.D. Krakowsky**, W.P. Williams, and G.L. Windham. 2005. Progress toward identifying new sources of genetic variation associated with reduced levels of aflatoxin accumulation in maize. Multicrop Aflatoxin/Fumonison Elimination and Fungal Genomics Workshop, October, 2005. (Abstr.)

Guo, B., M. Luo, H. Chen, M. Dang Phat, A.E. Coy, **M.D. Krakowsky**, D. Davis, W. Xu, X. Liang, C.C. Holbrook Jr., R. D. Lee, M.G. Bausher, A Culbreath, P. Ozias-Akins, and C.K. Kvien. 2005. Genetic and genomic approaches to improve host plant resistance to preharvest aflatoxin contamination in corn and peanut. Multicrop Aflatoxin/Fumonison Elimination and Fungal Genomics Workshop, October, 2005. (Abstr.)

Ni, X., W. Xu, **M.D. Krakowsky**, and G. D. Buntin. 2005. Evaluation for multiple pest resistance in fall armyworm- and corn earworm-resistant maize germplasm. Entomological Society of America Regional Meetings, December, 2005. (Abstr.)

Ni, X., W. Xu, **M.D. Krakowsky**, and G. D. Buntin. 2006. Field evaluations for multiple pest resistance in corn inbred lines and experimental hybrids. International Plant Resistance to Insects Workshop, February, 2006. (Abstr.)

Ni, X., W. Xu, **M.D. Krakowsky**, and G. D. Buntin. 2006. Spatial and temporal patterns of maize weevil pre-harvest infestation in corn fields. Annual Meeting of the Georgia Entomological Society, March, 2006. (Abstr.)

Education:

Ph.D. 2001. Plant Breeding, Iowa State University
M.S. 1999. Plant Breeding, Texas A&M University
B.S. 1993. Biology (Botany), Cornell University

Employment:

1993-1996 Graduate Research Assistant, Texas A&M University, College Station, TX
1996-2001 Graduate Research Assistant, Iowa State University, Ames, IA
2002-2003 Post Doctoral Fellow, International Center for the Improvement of Maize and Wheat, El Batan, Estado de Mexico, Mexico
2003-present GS-12, Research Geneticist, USDA-ARS, Crop Genetics and Breeding Research Unit, Tifton, GA

Scientific Society Services:

Memberships:

American Society of Agronomy, 1996-present

Scientific Journal Reviewer

Crop Science, Maydica, Phytopathology, Plant Disease, Plant Health Progress, and Theoretical and Applied Genetics

Extramural Funding:
Principal Investigator, Evaluation of maize germplasm for resistance to infection by *Aspergillus flavus* and contamination with aflatoxin ($4500, 3/06-9/06)
Principal Investigator, Effect of biotic stress on aflatoxin contamination and yield in corn ($6000, 3/06-9/06)

Xinzhi Ni, Research Entomologist

Progress:

Dr. Ni has been conducting research on corn and pearl millet resistance to insect pests for two years. Dr. Ni's research program has focused on three aspects of host plant resistance to insects. They are 1) to develop corn inbred lines that confer multiple insect resistance; 2) to determine biochemical and physiological mechanisms of crop resistance to insects; and 3) to unravel the mechanism of insect-elicited plant desistance to improve crop resistance to insect injury. He took an approach to identify insect-resistant corn and millet germplasm in the field first, and then to conduct laboratory experiments to determine the mechanisms of insect resistance, and ultimately to determine the genetics (or gene function) that is related to crop traits that confer insect resistance that had been shown in the field. Considerable progress has been made toward field screening of corn germplasm for multiple insect resistance. As the only entomologist in the Research Unit, Dr. Ni has collaborative research projects with all breeders. He has made progresses on the following studies related to the CRIS project:

* Continuous screening of 11 maize populations for their resistance to multiple insect herbivores. Eleven populations that confer fall armyworm resistance have been screened for maize weevil resistance.
* Six corn inbred lines that confer fall armyworm resistance were examined for their mechanisms of fall armyworm resistance. Two hybrids and two inbred lines were identified as multiple ear-feeding insect-resistant corn germplasm.
* Ten maize weevil-resistant maize populations are being screened for fall armyworm resistance.
* Spatial and temporal distribution patterns of maize weevil were examined to determine the necessity for artificial infestation for screening of maize weevil resistance in pre-harvest corn fields.
* Correlation between maize weevil, stink bug, and aflatoxin levels in preharvest corn fields is being examined, and fumonaisin level will also be examined.
* Correlation between maysin level in corn silk, stink bug injury, and smut infection on corn is being examined.

Plans:

Laboratory experiments will be conducted to examine biochemical and physiological mechanisms of the field-selected corn and/or pearl millet germplasm that confers insect resistance. Biochemical examinations will be focused on peroxidase, esterase, and lipoxygenase activities, which would elucidate redox balance, detoxification capability, and defensive signaling pathway of crop plants in reaction to insect herbivory. Physiological examinations will focus on photosynthesis, light and CO_2 response curves for plant primary metabolism. In addition, the mechanisms of insect-elicited plant injury will be examined to design and develop new crop germplasm that confers multiple insect resistance. Field selection for insect resistance in corn and millet will be continued to develop crop inbred lines with elite agronomic traits for the breeding programs.

Dr. Ni plans to work with the interdisciplinary team members to develop new pest management strategies that are economical, sustainable, and environmentally-sound. The team is also working on emerging pest problems (e.g. stink bugs) on major crops in our region.

Cooperators:

USDA-ARS

Craig Abel, Stoneville, MS
William F. Anderson, Tifton, GA
Ted Cottrell, Byron, GA
Corley Holbrook, Tifton, GA
Matthew Krakowsky, Tifton, GA
Andrea Maas, Tifton, GA
Paul Williams, Starkville, MS
Jeffrey P. Wilson, Tifton, GA

University

Steve Brown, University of Georgia, Tifton, GA
David Buntin, University of Georgia, Griffin, GA
Anton Coy, University of Georgia, Tifton, GA
Kedong Da, University of Georgia, Tifton, GA
Guna Gunawani, University of Georgia, Tifton, GA
Mike Kolomiets, Texas A&M University, College Station, TX
Dewey Lee, University of Georgia, Tifton, GA
John Rajewski, University of Nebraska, Lincoln, NE
David Riley, University of Georgia, Tifton, GA
John Ruberson, University of Georgia, Tifton, GA
Alton Sparks, Jr., University of Georgia, Tifton, GA
Wenwei Xu, Texas A&M University, Lubbock, TX

International

David Bergvinson, CIMMYT, Mexico

Peer-Reviewed Publications (2003-present):

Macedo, T., L. Higley, **X. Ni**, and S. S. Quisenberry. 2003. Light activation of Russian wheat aphid-elicited physiological responses in susceptible wheat. Journal of Economic Entomology 96:194-201.

Heng-Moss, T. M., **X. Ni,** T. Macedo, J. P. Markwell, F. P. Baxendale, S. S. Quisenberry, and V. Tolmay. 2003. Comparison of chlorophyll and carotenoid contents in Russian wheat aphid (Homoptera: Aphididae)-infested wheat isolines. Journal of Economic Entomology 96: 475-481.

Ni, X., and S. S. Quisenberry. 2003. Possible roles of esterase, glutathione S-transferase, and superoxide dismutase activities in understanding aphid-cereal interactions. Entomologia Experimentalis et Applicata 108: 187-195.

Wang, T., S. S. Quisenberry, **X. Ni**, and V. Tolmay. 2004. Aphid (Hemiptera: Aphididae) resistance mechanism in wheat near-isogenic lines. Journal of Economic Entomology 97: 646-653.

Wang, T., S. S. Quisenberry, **X. Ni**, and V. Tolmay. 2004. Enzymatic chlorophyll degradation in wheat near-isogenic lines elicited by cereal aphid (Hemiptera: Aphididae) feeding. Journal of Economic Entomology 97: 661-667.

Heng-Moss, T., G. Sarath, F. Baxendale, D. Novak, S. Bose, **X. Ni**, S. Quisenberry. 2004. Characterization of oxidative enzyme changes in Buffalograsses challenged by *Blissus occiduus*. Journal of Economic Entomology 97: 1086-1095.

Ni, X., and D. A. Streett. 2005. Modulation of water activity on fungicide effect on *Aspergillus niger* growth in sabouraud dextrose agar medium. Letters in Applied Microbiology 41: 428-433.

Ni, X. and S. S. Quisenberry. 2006. *Diuraphis noxia* and *Rhopalosiphum padi* interactions and their injury on resistant and susceptible cereal seedlings. Journal of Economic Entomology 99: 551-558.

Ni, X. and C. C. Holbrook. Using Nutrient Solutions to Trap the Almond Moth (Lepidoptera: Pyralidae) in a Peanut Shelling and Storage Facility. Journal of Entomological Science. Accepted on Oct. 10, 2005 (In press).

Quisenberry, S. S., and **X. Ni.** Feeding injury - a paradox of desistance and neoplasm. In: H. F. van Emden and R. Harrington (eds.), Aphids as Crop Pests, CAB International, Oxfordshire, UK. (Scheduled to be published in December 2006). (Invited book chapter). (In press).

Technical Reports

Ni, X., and M. D. Krakowsky. 2004. Evaluation of corn hybrids for insect resistance (Insect resistance evaluation on short-season hybrids -27 hybrids; insect resistance evaluation on mid-and full-season hybrids - 45 hybrids), pp. 34-36 In: A. E. Coy, J. L. Day, and P. A. Rose (eds.), Georgia 2004 Corn Performance Tests, Research Report 696, Georgia Agricultural Experiment Stations, Athens, GA. (Technical Report)

Ni, X., and J. C. Mullis. 2004. Evaluation of grain sorghum hybrids for resistance to the sorghum midge, pp. 44-45. In: J. L. Day, A. E. Coy, and P. A. Rose (eds.) Georgia 2004 Soybean, Sorghum Grain and Silage, and Summer Annual Forages Performance Tests, Research Report 697, Georgia Agricultural Experiment Stations, Athens, GA. (Technical Report)

Ni, X., M. D. Krakowsky, and K. Da. 2005. Evaluation of corn hybrids for insect resistance, pp. 35-37. In: A. E. Coy, J. L. Day, and P. A. Rose (eds.), Georgia 2005 Corn Performance Tests, Research Report 701, Georgia Agricultural Experiment Stations, Athens, GA. (Technical Report)

Ni, X., and J. C. Mullis. 2005. Evaluation of grain sorghum hybrids for resistance to the sorghum midge and sorghum ergot, pp. 43-44. In: J. L. Day, A. E. Coy, and P. A. Rose (eds.), Georgia 2005 Soybean, Sorghum Grain and Silage, and Summer Annual Forages Performance Tests, Research Report 702, Georgia Agricultural Experiment Stations, Athens, GA. (Technical Report)

Meeting Abstracts:

Ni, X. C. C. Holbrook, and K. Da. 2006. Biochemical and physiological mechanisms of TSWV-elicited desistance of peanut plants. Annual meeting for the American Peanut Research and Education Society, July 11-14, 2006. Hyatt Regency Savannah ,Savannah, GA.

Wilson, J. P., P. Timper, C. C. Truman, N. M. Dale, A. B. Batal, **X. Ni**, R. Gitaitis, A. J. McAloon, G. Shumaker, G. Dowling, J. Brown, T. Webster, and A. Maas. 2006. Economics-driven research and incentives for pearl millet production in the United States. Proceedings on The International Training Course on Pearl Millet Breeding and Seed Production Workshop, ICRISAT, Hyderabad, India, May 2-13, 1006. CD-ROM.

Da, K., **X. Ni**, G. D. Buntin, and S. L. Brown. 2006. Morphological and physiological responses of corn seedlings to brown and southern green stink bug feeding. Abstracts: The 70th Annual Meeting of the Georgia Entomological Society, March 29-31, 2006. Jekyll Island, GA.

Ni, X., K. Da, S. L. Brown, M. D. Krakowsky, D. Lee, A. Coy, and G. D. Buntin, 2006. Spatial and temporal patterns of maize weevil pre-harvest infestation in corn fields. Abstracts: The 70th Annual Meeting of the Georgia Entomological Society, March 29-31, 2006. Jekyll Island, GA.

Ni, X., J. Wilson, J. Rajewski, and D. Buntin. Evaluation of pearl millet germplasm for chinch bug resistance, the Annual Meeting of the Entomological Society of America, Dec. 17, 2005, Fort Lauderdale, FL. (abstract 0807).

Holbrook, C. C., A. K. Culbreath, E. G. Cantonwine, W. C. Johnson, and **X. Ni.** Georganic - A peanut cultivar for organic farming. American Society of Agronomy International Annual Meeting, Nov. 6-10, 2005, Salt Lake City, UT (abstract).

Krakowsky, M. D., **X. Ni**, R. F. Davis, and K. Da. Correlation between biotic stresses and aflatoxin contamination in maize. 2005 Aflatoxin Fumonisin Elimination Workshop, Oct. 23-26, 2005, Raleigh, NC. (abstract)

Ni, X., C. C. Holbrook. Using nutrient solutions to trap the almond moth (Lepidoptera: Pyralidae) in a peanut shelling and storage facility. American Peanut Research Education Society (APRES) Annual Meeting, July 12-15, 2005, Portsmouth, VA (abstract).

Ni, X., W. Xu and M. Krakowsky. 2004. Mechanisms of corn resistance to fall armyworm and corn earworm. The Annual Meeting of the Entomological Society of America, Nov. 16, 2004. Salt Lake city, UT (abstract).

Quisenberry, S., **X. Ni**, T. Wang, and V. Tolmay. 2004. Unraveling the etiology of aphid-elicited desistance to improve aphid resistance in wheat. Aug. 15, 2004, Brisbane, Queensland, Australia. XXII International Congress of Entomology, Symposium abstract S1-M06.

Education:

Ph.D. 1993	Entomology, University of Missouri-Columbia
M.S. 1989	Entomology, University of Idaho
B.S. 1983	Plant Protection, Northwestern Sci-Tech University of Agriculture and Forestry, Shaanxi, China

Work Experience:

2004-present	GS-13, Research Entomologist, USDA-ARS, Tifton, GA
2003-2004	GS-12, Research Entomologist, USDA-ARS, Stoneville, MS
2003	Research Associate Professor, Montana State University, Bozeman, MT
1999-2003	Research Assistant Professor, Montana State University, Bozeman, MT
1997-1999	Research Analyst, University of Nebraska, Lincoln, NE
1995-1997	Post-Doctoral Research Associate, University of Nebraska, Lincoln, NE
1993-1995	Post-Doctoral Research Associate, Montana State University, Bozeman, MT
1989-1993	Graduate Research Assistant, University of Missouri, Columbia, MO
1987-1989	Graduate Research Assistant, University of Idaho, Moscow, ID
1983-1987	Teaching and Research Assistant (faculty member), Northwestern Sci-Tech University of Agriculture and Forestry, Yangling, Shaanxi, China

Professional Service

Memberships:

Sigma Xi
Entomological Society of America
Georgia Entomological Society

Service in Professional Societies:

Resolutions Committee - Georgia Entomological Society
Secretary - Tifton Chapter of Sigma Xi, the Scientific Research Society

CRIS Project 6602-21000-018-00D
Development of Improved Peanut Germplasm with Resistance to Disease and Nematode Pests

Scientists/CRIS Scientific Effort
C. Corley Holbrook [Lead Scientist (80%)]

Progress:

Development of a Core of the Core Collection
We had previously developed a core collection (831 accessions) to represent the U.S. germplasm collection of peanut (8,000 accessions). This core collection has been very effective in enhancing the utilization of peanut genetic resources and has resulted in the identification of hundreds of new potential parents for peanut breeding programs. However, an even smaller subset of germplasm is needed to mine peanut germplasms for traits which are difficult and/or expensive to measure. We recently selected a core of the core collection (mini core) consisting of 112 accessions. Examination of disease resistance data indicated that this mini core collection can be used to improve the efficiency of identifying desirable traits in the entire germplasm collection. This subset of peanut germplasm is currently being used by other researchers to evaluate peanut germplasm for amino acid compositions, mechanisms of resistance to drought, and polymorphisms of molecular markers.

Development of Peanut Genotypes with Resistance to both the Peanut Root-knot Nematode and Tomato Spotted Wilt Virus (TSWV)
TifGP-1 was released as the first peanut germplasm to have moderate resistance to both TSWV and the peanut root-knot nematode. Based on the pedigree and the phenotypic observations, we believe that it contains some unique genes for resistance.
We plan to release C724-19-15 as the first peanut cultivar with a high level of resistance to TSWV and the peanut root-knot nematode. This is a high yielding, medium maturing genotype that should eliminate the need for nematicides even on land that is heavily infested with nematodes.

Development of Peanut Genotypes with Resistance to Drought and Preharvest Aflatoxin Contamination (PAC)
After devising large scale field screening techniques and identifying sources of resistance to drought and PAC, we built on these achievements by beginning a breeding program to combine this resistance with high yield and grade. Years of hybridization and selection have resulted in the identification of several breeding lines that have relatively high yield and relatively low PAC when grown under late season drought and heat stress. We plan to release C76-16 as a germplasm line due to its high level of resistance to drought and PAC.

Cooperator in Several Research Efforts to Develop Improved Molecular Genetic Tools for Peanut
We are actively cooperating with several molecular genetics groups who are attempting to develop improved molecular genetic tools for peanut. This research has resulted in the

development of a new and greatly improved molecular marker for nematode resistance. This marker can be used in a cost-effective, high throughput DNA extraction method and will hasten breeding efforts to combine nematode resistance with other important characteristics. These cooperative efforts have also resulted in the development and publication of several thousand est's, the development of the first tilling population for peanut, and the development of several recombinant inbred line populations that will be very useful in future efforts to develop marker assisted selection in peanut.

Plans:

Research is ongoing to build on our previous advances. Several hybridizations have been made with C724-19-15, the lines with high yield and excellent resistance to TSWV and the peanut root-knot nematode. The breeding objective for these populations is to combine the characteristic of C724-19-15 with high oleic acid and resistance to leaf spot. We are also using these and other populations in cooperative research effort to attempt to develop molecular markers for the high oleic trait, and for resistance to leaf spot and TSWV.

Breeding populations have also been created to improve the yield and grade of the material we developed with resistance to drought and PAC. Cooperative research efforts are also ongoing to: 1) attempt to develop improved selection methods for resistance to drought and PAC, 2) evaluate transgenic material for resistance to PAC, and 3) develop molecular markers for resistance to drought and PAC.

Cooperators

<u>USDA-ARS</u>	
William F. Anderson	USDA-ARS, Tifton, GA
Kelly D. Chenault	USDA-ARS, Stillwater, OK
Joe Dorner	USDA-ARS, Dawson, GA
Baozhu Guo	USDA-ARS, Tifton, GA
Andrea Maas	USDA-ARS, Tifton, GA
Xinzhi Ni	USDA-ARS, Tifton, GA
Roy Pittman	USDA-ARS, Griffin, GA
Diane Rowland	USDA-ARS, Dawson, GA
Dana Sullivan	USDA-ARS, Tifton, GA
Patricia Timper	USDA-ARS, Tifton, GA
<u>Universities</u>	
Tim Brenneman	University of Georgia, Tifton
Mark Burow	Texas A&M University
Emily C. Cantonwine	University of Georgia, Tifton
Ye Chu	University of Georgia, Tifton
Albert K. Culbreath	University of Georgia, Tifton
John Damicone	Oklahoma State University

Weibo Dong	University of Georgia, Tifton
Maria Gallo-Meagher	University of Florida
Daniel W. Gorbet	University of Florida
Thomas G. Isleib	North Carolina State University
Steven J. Knapp	University of Georgia, Athens
Craig K. Kvien	University of Georgia, Tifton
M. Luo	University of Georgia, Tifton
J. P. Noe	University of Georgia, Athens
Peggy Ozias-Akins	University of Georgia, Tifton
H. Thomas Stalker	North Carolina State University
Barry Tillman	University of Florida
Arthur Weissinger	North Carolina State University
David M. Wilson	University of Georgia, Tifton
Huiqin Xue	North Carolina State University

International

Alan Cruickshank	Dept. of Primary Industries and Fisheries, Australia
Sanun Jogloy	Khon Kaen University, Thailand
X. Liang	Guangdong Academy of Agricultural Sci., Guangdong, China
Boshou Liao	Oil Crops Research Institute, Wuhan, China
Sumran Pimratch	Khon Kaen University, Thailand
Patcharin Songsri	Khon Kaen University, Thailand
Graeme Wright	Dept. of Primary Industries and Fisheries, Australia

Peer Reviewed Publications (last 3 years)

Anderson, W. F., **C. C. Holbrook**, and P. Timper. 2006. Registration of root-knot nematode resistant peanut germplasm lines NR 0812 and NR 0817. Crop Sci. 46:481-482.

Anderson, W. F., G. Kochert, **C. C. Holbrook**, and H. T. Stalker. 2004. Phenotypic and molecular evaluation of interspecific peanut lines. Peanut Sci. 31:65-70.

Barkley, N. A., R. E. Dean, R. N. Pittman, M. L. Wang, **C. C. Holbrook**, and G. A. Pederson. M13-tailed SSR method: An effective method for determining diversity in cultivated peanut. Crop Sci. (In Review).

Burton, J. W., J. F. Miller, B. A. Vick, R. Scarth, and **C. C. Holbrook**. 2004. Altering Fatty Acid Composition in Oil Seed Crops. In: D. L. Sparks (ed.) Advances in Agron. 84:273-305. (Book Chapter)

Cantonwine, E. C., A. K. Culbreath, **C. C. Holbrook**, W. D. Branch, and D. W Gorbet. 2003. Field response of runner-type genotypes to multiple disease under conventional and strip-tillage, 2002. Biol. and Cult. Tests for Cntrl. of Plant Dis. 18:9.

Chu, Y., **C. C. Holbrook**, P. Timper, and P. Ozias-Akins. Development of a PCR-based molecular marker to select for nematode resistance in peanut. Crop Sci. (In Review).

Culbreath, A. K., D. W. Gorbet, N. Martinez, **C. C. Holbrook**, J. W. Todd, T. G. Isleib, and B. Tillman. 2005. High levels of field resistance to tomato spotted wilt virus in peanut breeding lines from *hypogaea* and *hirsuta* botanical varieties. Peanut Sci. (Accepted Aug. 11).

Dong, W., Y. Shi, **C. C. Holbrook**, P. Timper, and J. P. Noe. 2003. Evaluation of assessment methods to rapidly identify resistance to Meloidogyne arenaria in greenhouse screening of peanut. J. of Peanut Sci. 29:127-132.

Guo, B. Z., **C. C. Holbrook**, and R. E. Lynch. 2003. Nucleotide sequence of a cDNA clone for phospholipase D (PLD) mRNA from peanut (*Arachis hypogaea* L.). Genbank, National Center for Biotechnology Information. Accession No. AY274834.

Guo, B. Z., **C. C. Holbrook**, J. Yu, R. D. Lee, and R. E. Lynch. 2005. Application of technology of gene expression in response to drought stress and elimination of preharvest aflatoxin contamination. In: Aflatoxin and Food Safety, H. Abbas (ed.), CRC Press, Boca Raton, FL. pp. 313-331.

Guo, B. Z., M. Luo, P. Dang, G. He, and **C. C. Holbrook**. 2004. Peanut expressed sequence tag (EST) project and the marker development for cultivated peanut (*Arachis hypogaea*). Proc. 4th International Crop Science Congress. www.cropscience.org.au.

Guo, B. Z., M. Luo, and **C. C. Holbrook**. 2003. Nucleotide sequence of 1345 ESTs (expressed sequence tags) from peanut (Arachis hypogaea). GenBank, National Center for Biotechnology Information. Accession No. CD037499 to CD038843. http://www.ncbi.nlm.nih.gov/dbEST.

Guo, B. Z., G. Xu, Y. G. Cao, **C. C. Holbrook**, and R. E. Lynch. 2006. Identification and characterization of phospholipase D and its association with drought susceptibilities in peanut (*Arachis hypogaea*). Planta 223:512-520.

Guo, B. Z., J. Yu, **C. C. Holbrook**, R. D. Lee, and R. E. Lynch. 2003. Application of differential display RT-PCR and EST/microarray technology to the analysis of gene expression in response to drought stress and aflatoxin contamination. J. Toxicology-Toxin Reviews 22:287-312. 2003.

Holbrook, C. C., and A. K. Culbreath. Registration of 'Tifrunner' peanut cultivar. Crop Sci. (In Review).

Holbrook, C. C., and A. K. Culbreath. Registration of 'Georganic' peanut cultivar. Crop Sci. (In Review).

Holbrook, C. C., and W. Dong. 2005. Development and evaluation of a mini-core collection for the U.S. peanut germplasm collection. Crop Sci. 45:1540-1544.

Holbrook, C. C., B. Z. Guo, D. M. Wilson, and C. K. Kvien. 2004. Effect of drought tolerance on preharvest aflatoxin contamination in peanut. Proc. 4th International Crop Science Congress. www.cropscience.org.au.

Holbrook, C. C., and H. T. Stalker. 2003. Peanut Breeding and Genetic Resources. In: J. Janick (ed.) Plant Breeding Reviews 22:297-356. (Book Chapter)

Holbrook, C. C., P. Timper, and A. K. Culbreath. 2003. Resistance to tomato spotted wilt virus and root-knot nematode in peanut interspecific breeding lines. Crop Sci. 43:1109-1113.

Holbrook, C. C., P. Timper, and A. K. Culbreath. Registration of peanut germplasm TifGP-1 with resistance to TSWV and the peanut root-knot nematode. Crop Sci. (In Review).

Liang, X. Q., **C. C. Holbrook**, R. E. Lynch, and B. Z. Guo. 2005. β-1-3-glucanase activity in peanut seed (*Arachis hypogaea* L.) is induction by inoculation with *Aspergillus flavus* and copurifies with a conglutin-like protein. Phytopathology 95:506-511.

Luo, M., P. Dang, M. G. Bausher, **C. C. Holbrook**, R. D. Lee, R. E. Lynch, and B. Z. Guo. 2005. Identification of transcripts involved in resistance responses to leaf spot disease caused by *Cercosporidium personatum* in peanut (*Arachis hypogaea* L.). Phytopathology 95:381-387.

Luo, M., P. Dang, B. Z. Guo, **C. C. Holbrook**, M. G. Bausher, and R. D. Lee. 2005. Generation of expressed sequence tags (ESTs) for gene discovery and marker development in cultivated peanut. Crop Science 45:346-353.

Luo, M., X. Q. Liang, P. Dang, **C. C. Holbrook**, M. G. Bausher, R. D. Lee, and B. Z. Guo. 2005. Microarray-based screening of differentially expressed genes in peanut in response to *Aspergillus parasiticus* infection and drought stress. Plant Science 169:695-703.

Ni, Xinzhi, and **C. Corley Holbrook**. Using nutrient solutions to trap the almond moth (*Lepidoptera*: *Pyralidae*) in a peanut shelling storage facility. J. of Entomological Science. (In Press).

Sullivan, D. G., **C. C. Holbrook**, and C. Kvien. Remote sensing in screening for abiotic stress tolerance in peanut. Crop Sci. (In Review).

Timper, P., **C. C. Holbrook**, and W. F. Anderson. 2003. Reproduction of *Meloidogyne* spp. on resistant peanut genotypes from three breeding programs. J. of Nematology. 35:417-421.

Timper, P., D. M. Wilson, **C. C. Holbrook**, and B. W. Maw. 2004. Relationship between *Meloidogyne arenaria* and aflatoxin contamination in peanut. Journal of Nematology 36:167-170.

Wilson, J. P., **C. C. Holbrook**, B. Mandel, D. Rowland, M. L. Wells, and D. M. Wilson. 2003. Efficacy of foliar applications of particle films and genotype for managing thrips, diseases, and aflatoxin in peanut. Plant Health Progress. doi:10.1094/PHP-2004-0419-01-RS.

Non Peer Reviewed Publications (last 3 years)

Augusto, J., M. Coulibaly, D. M. Wilson, **C. C. Holbrook**, and N. W. Widstrom. 2004. Screening methods for determination of aflatoxins in peanut and corn. Aflatoxin Elimination Workshop p. 104.

Brenneman, T. B., **C. C. Holbrook**, and A. K. Culbreath. 2005. Screening cultivars and advanced germplasm for multiple disease resistance. Proc. Amer. Peanut Res. and Educ. Soc. 37:30.

Burow, M., J. Ayers, R. Del Aguila, D. Porter, A. M. Schubert, J. Wallace, D. Rowland, and **C. Holbrook.** 2003. Response of peanut accessions to water stress. Agron. Abstr. Cd. Rom.

Cantonwine, E., **C. C. Holbrook**, A. K. Culbreath, W. C. Johnson, and D. Olson. 2004. Breeding peanut for organic farming - Opportunities and obstacles. Agron. Abstr. #5530 Cd Rom.

Chenault, K. D., and **C. C. Holbrook**. 2003. Aflatoxin accumulation in transgenic peanut lines containing anti-fungal genes. Proc. Aflatoxin Elimination Workshop. p. 121.

Chenault, K. D., H. A. Melouk, and **C. C. Holbrook**. 2004. Post-harvest aflatoxin accumulation in transgenic peanut lines containing anti-fungal genes. Amer. Phytopathological Society 94:518.

Chu, Y., P. Ozias-Akins, **C. C. Holbrook**, and P. Timper. 2005. Marker-assisted selection for nematode resistance. Proc. Amer. Peanut Res. and Educ. Soc. 37:25.

Damicone, J. P., K. E. Jackson, K. E. Dashiell, H. A. Melouk, and **C. C. Holbrook**. 2003. Reaction of the peanut core collection to sclerotinia blight and pepper spot. Proc. Amer. Peanut Res. and Educ. Soc. 35:55.

Damicone, J. P., W. D. Scruggs, and **C. C. Holbrook**. 2005. Yield response of selected entries from peanut core collection to fungicide for control of Sclerotinia blight. Proc. Amer. Peanut Res. and Educ. Soc. 37:29.

Dong, W., **C. C. Holbrook**, P. Timper, T. Brenneman, and J. P. Noe. 2005. Development and utilization of a more rapid assessment method to identify resistance to *Meloidogyne arenaria* in peanut. Proc. Amer. Peanut Res. and Educ. Soc. 37:35.

Dong, W. B., **C. C. Holbrook**, P. Timper, and J. P. Noe. 2003. Comparison of inoculation methods to more rapidly identify peanut genotypes with resistance to *Meloidogyne arenaria*. Proc. Amer. Peanut Res. and Educ. Soc. 35:82.

Dong, W. B., **C. C. Holbrook**, P. Timper, J. P. Noe, and Y. Shi. 2004. Evaluation of assessment methods to rapidly identify resistance to *Meloidogyne arenaria* in greenhouse screening of peanut. Proc. 15th International Plant Protection Congress. p. 399.

Guo, B. Z., X. Q. Liang, and **C. C. Holbrook**. 2004. Laboratory and field screening of peanut germplasm for sources of resistance to preharvest aflatoxin contamination. Aflatoxin Elimination Workshop p. 69.

Guo, B. Z., X. Q. Liang, S. J. Maleki, S. Y. Chung, **C. C. Holbrook**, and P. Ozias-Akins. 2004. Characterization of five seed-proteins missing in one peanut genotype and the allergic nature of these proteins. Proc. Amer. Peanut Res. and Educ. Soc. 36:28.

Guo, B. Z., X. Z. Liang, M. Luo, P. Dang, and **C. C. Holbrook**. 2003. Molecular characterization of resistance mechanisms to aflatoxin contamination and generation of ESTs and chips for analysis of gene expression in peanut. Proc. Aflatoxin Elimination Workshop p. 22.

Guo, B., M. Luo, H. Chen, A. E. Coy, M. D. Krakowsky, **C. C. Holbrook**, X. Liang, R. D. Lee, and C. K. Kvien. 2005. Genetic and genomic approaches to improve host resistance to preharvest aflatoxin contamination in corn and peanut. Proc. Aflatoxin Elimination Workshop (In press).

Guo, B. Z., M. Luo, D. Lee, P. Dang, M. G. Bausher, and **C. C. Holbrook**. 2005. Microarray analysis of differentially expressed genes involved in resistance responses to late leaf spot disease caused by Cercosporidium personatum in peanut. Proc. Amer. Peanut Res. and Educ. Soc. 37:27.

Guo, B. Z., M. Luo, X. Liang, M. L. Wang, and **C. C. Holbrook**. 2004. Progress in peanut functional genomics, a strategy to mitigate aflatoxin contamination and improve other important traits. Aflatoxin Elimination Workshop p. 52.

Guo, B. Z., V. Sobolev, **C. C. Holbrook**, and R. E. Lynch. 2003. Impact of phytoalexins and lesser cornstalk borer damage on resistance to aflatoxin contamination. Proc. Amer. Peanut Res. and Educ. Soc. 35:65.

Holbrook, C. C., A. K. Culbreath, E. G. Cantonwine, W. C. Johnson, and X. Ni. 2005. Georganic - A peanut cultivar for organic farming. Agron. Abstr. Cd Rom.

Holbrook, C. C., and W. B. Dong. 2003. Selection of a core of the core collection for peanut. Proc. Amer. Peanut Res. and Educ. Soc. 35:29.

Holbrook, C. C., and W. B. Dong. 2003. Evaluation of a core of the core collection for peanut. Agron. Abstr. Cd Rom.

Holbrook, C. C., B. Z. Guo, M. Luo, and P. Ozias-Akins. 2004. Use of molecular genetics to develop disease resistant peanut cultivars. Proc. 15th International Plant Protection Congress. p. 64.

Holbrook, C. C., B. Z. Guo, and D. M. Wilson. 2005. Breeding peanut with resistance to drought and preharvest aflatoxin contamination. Proc. Amer. Peanut Res. and Educ. Soc. 37:51.

Holbrook, C. C., B. Z. Guo, D. M. Wilson, X. Q. Liang, M. Luo, P. Timper, H. Q. Xue, and T. Isleib. 2004. Tools for breeding peanut with resistance to preharvest aflatoxin contamination. Aflatoxin Elimination Workshop p. 50.

Holbrook, C. C., B. Z. Guo, D. M. Wilson, M. Luo, and X. Liang. 2003. Breeding peanut for resistance to preharvest aflatoxin contamination and drought tolerance. Proc. Aflatoxin Elimination Workshop. p. 63.

Holbrook, C. C., B. Guo, D. M. Wilson, D. G. Sullivan, E. Cantonwine, and C. K. Kvien. 2005. Progress in breeding peanut for resistance to preharvest aflatoxin contamination and drought. Proc. Aflatoxin Elimination Workshop (In press).

Holbrook, C. C., H. Jiang, B. Liao, H. Duan, X. Q. Liang, and B. Z. Guo. 2004. Selection and evaluation of a core collection for peanut germplasm in China. Agron. Abstr. #5603 Cd Rom.

Jiang, H., B. Liao, H. Duan, X. Q. Liang, **C. C. Holbrook**, and B. Z. Guo. 2004. Development of a core collection of peanut germplasm in China. Proc. Amer. Peanut Res. and Educ. Soc. 36:33.

Lei, Y., B. Liao, S. Wang, H. Jiang, **C. C. Holbrook**, and B. Z. Guo. 2004. Molecular marker for resistance to seed infection by *Aspergillus flavus* in peanut. Proc. Amer. Peanut Res. and Educ. Soc. 36:79-80.

Lei, Y., B. Liao, S. Wang, H. Jiang, **C. C. Holbrook**, and B. Z. Guo. 2004. Development of a molecular marker for resistance to seed infection by Aspergillus flavus in peanut. Aflatoxin Elimination Workshop p. 64.

Liang, X. Q., B. Z. Guo, and **C. C. Holbrook**. 2004. Identification of peanut seed-storage proteins associated with resistance against *Aspergillus flavus* infection and aflatoxin production. Proc. Amer. Peanut Res. and Educ. Soc. 36:74-75.

Liang, X. Q., B. Z. Guo, and **C. C. Holbrook**. 2005. B-1,3-Glucanase activity in peanut seed and is induced by infection of *Aspergillus flavus*. Proc. Amer. Peanut Res. and Educ. Soc. 37:90.

Liang, X., B. Z. Guo, and **C. C. Holbrook**. 2005. Peanut PR protein, B-1,3-glucanase, induction by *Aspergillus flavus* and copurification with a conglutin-like protein. Proc. Aflatoxin Elimination Workshop (In press).

Liang, X. Q., B. Z. Guo, **C. C. Holbrook**, and R. E. Lynch. 2003. Resistance to *Aspergillus flavus* in peanut seeds is associated with constitutive trypsin inhibitor and inducible chitinase and B-1-3-glucanase. Proc. Amer. Peanut Res. and Educ. Soc. 35:85.

Liang, X. Q., B. Z. Guo, **C. C. Holbrook**, and R. E. Lynch. 2003. Relationship of antifungal protein trypsin inhibitor in peanut resistant and susceptible to *Aspergillus flavus*. Proc. Aflatoxin Elimination Workshop p. 69.

Liang, X. Q., B. Z. Guo, **C. C. Holbrook**, and R. E. Lynch. 2003. Differential induction of antifungal protein chitinase and Beta-1-3-Glucanase by *Aspergillus flavus* in different peanut lines. Proc. Aflatoxin Elimination Workshop p. 70.

Liang, X., B. Z. Guo, **C. C. Holbrook**, and R. E. Lynch. 2004. Peanut storage protein, conglutin-like protein, has B-1,3-glucanase activity and is induced by colonization with *Aspergillus flavus*. Aflatoxin Elimination Workshop p. 67.

Liang, X., B. Z. Guo, **C. C. Holbrook**, and R. E. Lynch. 2004. A nonspecific lipid transfer protein and an allergen Ara h 1-like protein are associated with the resistance to *Aspergillus spp* in peanut. Aflatoxin Elimination Workshop p. 68.

Liao, B., Y. Lei, S. Wang, H. Jiang, **C. C. Holbrook**, and B. Z. Guo. 2003. Reaction to aflatoxin contamination among peanut germplasm lines with resistance to bacterial wilt. Proc. Aflatoxin Elimination Workshop p. 71.

Luo, L. M., P. Dang, B. Z. Guo, **C. C. Holbrook**, and M. Bausher. 2003. Application of EST technology in functional geneomics of *Arachis hypogaea* L. Proc. Amer. Peanut Res. and Educ. Soc. 35:35.

Luo, M., P. Dang, G. He, B. Z. Guo, and **C. C. Holbrook**. 2003. Functional genomics of *Arachis hypogaea* L. for understanding host peanut and *Aspergillus* interactions. Proc. Aflatoxin Elimination Workshop p. 67.

Luo, M., P. M. Dang, X. Liang, **C. C. Holbrook**, and B. Guo. 2004. Identification of resistance related gene in peanut using microarray analysis. Plant and Animal Genome XII Conference. p. 882.

Luo, M., **C. C. Holbrook**, R. D. Lee, M. G. Bausher, and B. Guo. 2005.Identification of resistance genes in a peanut genotype against *Aspergillus flavus* infection and drought stress. Proc. Plant and Animal Genome XIII Conference. p. 740.

Luo, M., X. Q. Liang, B. Z. Guo, P. Dang, **C. C. Holbrook**, and R. D. Lee. 2004. Micro-array based screening of differentially expressed genes in peanut in response to *Aspergillus parasiticus* infection and drought stress. Aflatoxin Elimination Workshop p. 66.

Luo, M., R. D. Lee, X. Q. Liang, B. Z. Guo, and **C. C. Holbrook**. 2004. Identification of transcripts in peanut cultivars resistant to late leaf spot *Cercosporidium personatum*. Proc. Amer. Peanut Res. and Educ. Soc. 36:75.

Ni, X., and **C. C. Holbrook**. 2005. Using nutrient solutions to trap the almond moth (Lepidoptera: pyralidae) in a peanut shelling and storage facility. Proc. Amer. Peanut Res. and Educ. Soc. 37:83.

Sullivan, D. G., and **C. C. Holbrook**. 2005. Using a remotely sensed crop index to enhance selection for drought tolerant peanuts. Proc. Aflatoxin Elimination Workshop p. x.

Sullivan, D. G.,.C **C. Holbrook**, and C. Kvien. 2004. Measuring canopy reflectance to improve the development of drought resistance in peanuts. 2004 Georgia Peanut Research and Extension Report.

Sullivan, D., **C. Holbrook**, and C. Kvien. 2005. Ground-based remote sensing for rapid selection of drought and aflatoxin resistant peanut genotypes. Agron. Abstr. Cd Rom.

Timper, P., T. B. Brenneman, and **C. C. Holbrook**. 2003. Effectiveness of vapam for controlling root-knot nematodes in peanut. 2002 Georgia Peanut Research and Extension Report. pp. 64-66.

Timper, P., **C. C. Holbrook**, and D. M. Wilson. 2005. Mechanism of preharvest aflatoxin contamination in peanut infected by root-knot nematodes. Proc. Aflatoxin Elimination Workshop (In press).

Timper, P., D. M. Wilson, and **C. C. Holbrook**. 2003. Root-knot nematodes and preharvest aflatoxin contamination in peanut. Proc. Aflatoxin Elimination Workshop p. 101.

Timper, P., D. M. Wilson, and **C. C. Holbrook**. 2004. The influence of pod and root galling by root-knot nematodes on preharvest aflatoxin contamination of peanut. Aflatoxin Elimination Workshop p. 101.

Wallace, J. R., J. J. Burke, A. M. Schubert, M. D. Burow, D. L. Rowland, J. Ayers, D. Porter, and **C. C. Holbrook.** 2004. Development of peanut varieties with drought and heat tolerance with the use of molecular methods. Proc. Amer. Peanut Res. and Educ. Soc. 36:23-24.

Wang, M. L., N. Barkley, R. Dean, **C. C. Holbrook**, and R. N. Pittman. 2004. Transfer of *Medicago* EST-SSRs to peanut for germplasm evaluation and cross-species cloning. Proc. Amer. Peanut Res. and Educ. Soc. 36:26.

Education:

Ph.D.: North Carolina State University, Raleigh, NC. Major, Crop Science (Plant Breeding) with Statistics Minor. 1985.

M.S.: University of Florida, Gainesville, FL. Major, Agronomy (Plant Breeding) with Statistics Minor. 1981.

B.S.: University of Florida, Gainesville, FL. Major, Agronomy with Science Specialization. 1979.

Work Experience:

Research Leader: USDA-ARS, Tifton, GA. Crop Genetics and Breeding Research Unit. April 2004 - present.

Acting Research Leader: USDA-ARS, Tifton, GA. Crop Genetics and Breeding Research Unit. 2003.

Research Geneticist: GS-14. USDA-ARS, Tifton, GA. Supervisor: W. W. Hanna, Supervisory Res. Genet. 2002-2003.

Acting Research Leader: USDA-ARS, Tifton, GA. Nematodes, Weeds, and Crops Research Unit. 1 Oct. 1999-17 Feb. 2000.

Research Geneticist: GS-13. USDA-ARS, Tifton, GA. Supervisor: A. W. Johnson, W. W. Hanna. Supervisory Res. Plant Path. 1992-1999.

Research Geneticist: GS-12. USDA-ARS, Tifton, GA. Supervisor: A. W. Johnson, Supervisory Res. Plant Path. 1989-1992.

Research Geneticist: GS-11. USDA-ARS, Tifton, GA. Supervisor: A. W. Johnson, Supervisory Res. Plant Path. 1985-1989.

Graduate Research Assistant: Department of Crop Science, North Carolina State University. 1981-1985.

Graduate Teaching Assistant: Department of Agronomy, University of Florida. 1979-1981.

Graduate Teaching Assistant: Department of Agronomy, University of Florida. 1979-1981.

Honors and Awards

Received USDA Award for Excellence and Achievement as Early Career Scientist (1/18/89) ($2,000 cash award). Presented for productivity in scientific achievement as evidenced by quality and quantity of manuscripts prepared for publication in FY 1988.

Awarded Certificate of Merit for an Outstanding Scientific Paper. Amer. Peanut Res. and Educ. Soc. July, 1988.

Awarded Certificate of Merit for an Outstanding Scientific Paper. Amer. Peanut Res. and Educ. Soc. July, 1992.

Received Bailey Award from the Amer. Peanut Res. and Educ. Soc. July, 1996. Award was for recognition as coauthor for the work judged as the best presentation and manuscript of the 1995 annual meeting.

Coauthor of presentation receiving the Joe Sugg Graduate Student Award from the Amer. Peanut Res. and Educ. Soc. July, 1997.

Received Coyt T. Wilson Award from the Amer. Peanut Res. and Educ. Soc. July, 1998 ($1,000 cash award). Award was in recognition of outstanding service to the society.

Coauthor of presentation receiving the Joe Sugg Graduate Student Award from the Amer. Peanut Res. and Educ. Soc. July, 1998.

Recipient of the 1999 Creative Research Award presented by the Tifton Chapter of Sigma Xi. May, 1999.

USDA-ARS-SAA; Superior Performance. 2000, 2001.

USDA-ARS-SAA; Outstanding Performance. 1998, 1999, 2002, 2003, 2004, 2005.

Received certificate of appreciation for six years of service as an Associate Editor of PEANUT SCIENCE, the official journal of the American Peanut Research and Education Society. July, 1999.

Received certificate of appreciation for three years of service as an Associate Editor of CROP SCIENCE, November, 2003.

Inducted as Fellow for the American Society of Agronomy, November, 2004.

Received 2006 Tifton Sigma Xi Distinguished Research Award, May 2006.

Inducted as Fellow for the American Peanut Research and Education Society, July 2006.

Memberships in Professional Societies

Crop Science Society of America
American Society of Agronomy
American Peanut Research and Education Society
American Peanut Council
Sigma Xi

Offices and Committee Assignments Held

Technical Program Chair for the 22nd Annual Meeting of the American Peanut Research and Education Society. Atlanta, GA. 1990.

Editor of "Peanut Research", 1987-1998. Responsible for compiling, approving, editing, printing and maintaining the quality of this quarterly publication received by 742 members of the American Peanut Research and Education Society.

Ex Officio member of the Publications and Editorial Committee, American Peanut Research and Education Society, 1987-1998.

Member (1986-present), Vice Chair (1996), Acting Chair (1997-1998) and Chair (1999-2001) of National Peanut Crop Germplasm Committee.

President-elect (1995) and President (1996) of the Tifton Sigma Xi Chapter. Member (1990-1993) Admissions and Credentials Committee. Member (1992-1995)(1999-2002) and Chair (1995)(2001) Program Committee.

Vice Chair (1989-1990) and Chair (1991-1992) of the Georgia Peanut Commodity Committee.

Member University of Georgia Germplasm Release Committee 1992-1997.

Member Crop Sci. Soc. of America C852 Committee (Crop Registration Committee) 1994-2000.

Chair (1995-1997) Peanut Quality Committee, Amer. Peanut Res. and Educ. Society.

Member Technical Program Committee for the 31st Annual Meeting of the American Peanut Research and Education Society. Savannah, GA. 1999.

Member of APRES, Coyt T. Wilson Award Committee (2001-2004), (2205-present).

Member of Board of Directors, Amer. Peanut Res. and Educ. Society (2001-2004).

Member J. Fielding Reed Scholarship Committee of the American Soc. of Agron. (2001-2004).

Member (2002-2005) Chair (2005) APRES, Fellows Committee.

List of Appendices

Buildings
Crop Genetics and Breeding Research Unit

Federal Buildings
#19 - Greenhouse/Headhouse - 2294 Rainwater Rd
#20 - Greenhouse - 2284 Rainwater Rd
#21 - Quonset Hut - 2282 Rainwater Rd
#22 - Vehicle Storage Building - 2288 Rainwater Rd
#23 - Chemical Storage - 2288A Rainwater Rd
#24 - Office/Lab/Greenhouse - Triangle - 2054 Moore Hwy
#28 - Greenhouse - 125A Tobacco Rd
#30 - Greenhouse - 133 Tobacco Rd
#40 - Storage Building - Gibbs Farm
#41 - Greenhouse - 136 Tobacco Rd
#42 - Greenhouse - Triangle - 2056 Moore Hwy
#56 - Metal Shed - across from RDC
#60 - Storage/Potting Shed - Triangle - 2508 Moore Hwy
#61 - Cold Storage - behind Red Top Barn #2
#62 - Shop/Storage/Equipment Shed - across from RDC

UGA Buildings

Plant Science Bldg. 8 rooms
Red Top Barn - Peanut Shelling Lab - Bldg. 4675
Storage Bldg beside Red Top Barn (12'x17')
Bldg. 4651 - Rainwater Rd. (2 small rooms) Wilson/Hanna
Bldg. 4679 - RDC Road - fuel room
2 room bldg. behind Branch's greenhouse on Tobacco Rd. (Anderson)
Fertilizer shed - bldg. in front of Grass group equipment shed - RDC

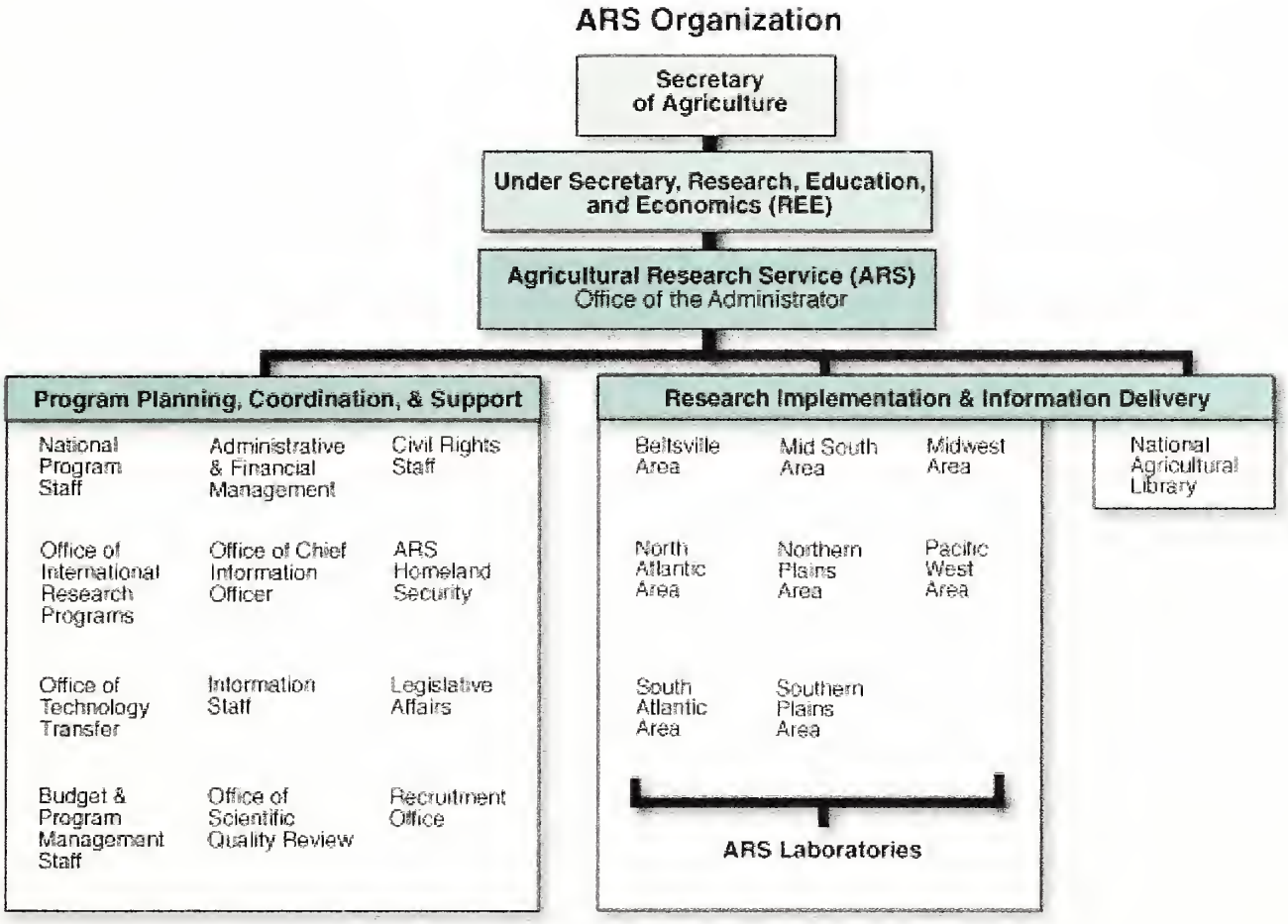
UGA Greenhouses

1 - Greenhouse at Triangle

UGA Headhouses

Bldg. 620 - headhouse (4 bay greenhouse - Federal)
Bldg. 623 - headhouse (6 bay greenhouse - Federal)

Appendix 2. USDA, ARS Organizational Chart



Appendix 3. USDA, ARS, South Atlantic Area Organizational Chart

USDA, ARS
South Atlantic Area

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